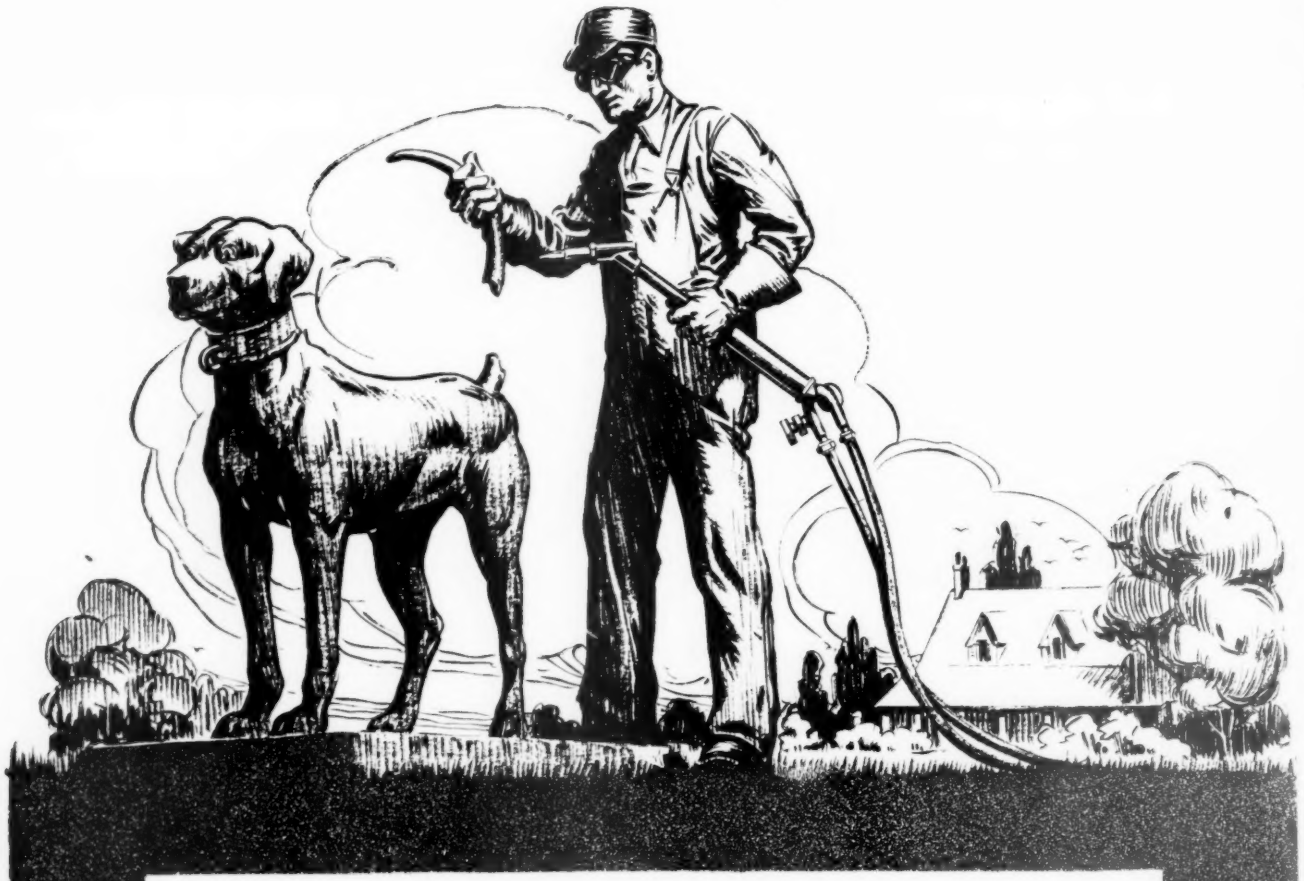
place a 1-cent stamp on this notice, hand same to any postal employee, and it will be placed in the hands of our soldiers or sailors at the front. No wrapping; no address.
A. S. Burleson, Postmaster General.

The Welding Engineer

Vol. III. | Chicago 608 S. Dearborn St. | MAY, 1918 | $2.00 per year in U. S. $2.50 per year abroad | No. 5

A TORCHWELD JOB
WHETHER welding "right down hand" in the shop where working conditions are ideal, or on such a constructive job as shown here, demanding every possible welding position, for efficiency, economy and conservation of time, equip your men with
"TORCHWELD" WELDING TORCHES
THE JOB: For a large Illinois chemical plant engaged in the world's most necessary work
Two tanks, 17 feet 4 inches in diameter, made of ⅝-in. black iron plates, with 4-section bottoms and 5-section walls, were assembled and welded into two tank-units with TORCHWELD equipment. All the welding was done in position on the platform. An interesting feature was the welding of overflow rims on each tank, 12-in. deep and 4-in. wide.
"TORCHWELD" TORCHES should be the welding engineer's choice, not only for the occasional job, but for all routine industrial welding work, because of their light weight, their soft flame, their delicately balanced pressure on both gases and low velocity of gases with a perfect mixture. These points of superiority alone mean
"Better Welding in Less Time"
Write for "Torchweld" Bulletin. Consult us on all Welding and Metal Cutting Problems
TORCHWELD EQUIPMENT COMPANY
230 North Carpenter Street, Chicago
Manufacturers of High Grade Welding and Cutting Equipments, Welding Materials, Fluxes, Supplies and Accessories



Welding a Dog's Tail

THE dog is, of course, a cast-iron specimen. To mend his broken tail with an OXWELD BLOWPIPE was a simple operation. Variations of this unique application are common in all the big museums where the same welding equipment is used to repair all sorts of broken bronze or metal art objects. Such uses are, of course, comparatively small.

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OXWELD SERVICE HELP—means the co-operation of our big staff of experts in the work of making your welding and cutting equipment *earn what it should.*

Oxweld

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Milburn mixing principle produces best work with minimum gas, and no flash backs, burnt tips, or other annoyances.

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5 Everything needed for oxy-acetylene work we supply.

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Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

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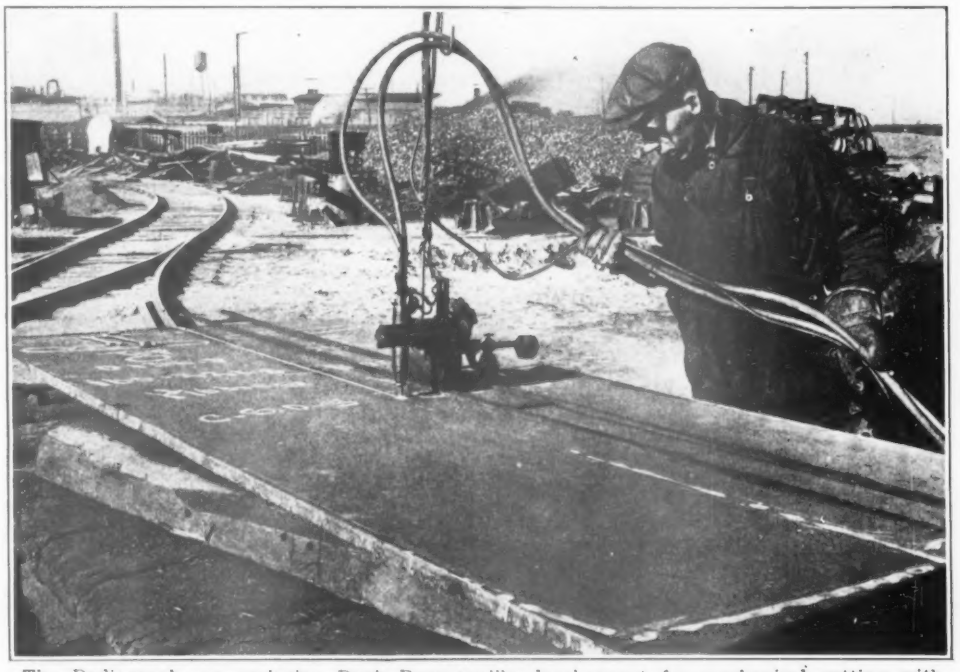
The Value of Oxy-Acetylene And Davis-Bournonville Apparatus

has never been so fully demonstrated as during the past year of government preparations and demands upon the foundries, steel mills, munitions plants, and the entire metal-working industry, and particularly in the great shipbuilding program.



The Radiagraph, an exclusive Davis-Bournonville development for mechanical cutting with the oxy-acetylene or oxy-hydrogen flame, employed for cutting steel plate in the New York Shipbuilding Yard.—Photo by New York Shipbuilding Corpn.

Exclusive developments in mechanical cutting and welding with Oxy-Acetylene and Oxy-Hydrogen have been of invaluable assistance to metal workers, coupled with highest efficiency in results and lowest operating cost. The Radiagraph cuts from ½-in. to 20-in. steel plate, in straight lines or circles. The Oxygraph cuts in any direction, according to pattern or drawing, along straight lines, curves or sharp angles. Speed from 3 to 18 inches per minute according to thickness.

"Davis Apparatus" has been continuously and effectively developed from the time the company brought the positive, independent pressure system of oxy-acetylene welding and cutting to the United States ten years ago, and is backed by the longest practical experience, greatest development, and widest application, providing portable hand welding and cutting outfits or the most complete installations with acetylene and oxygen and hydrogen producing and compressing plants.

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WOULD you see the eyes of whole nations well up with tears of gratefulness at the mention of a name? Then ask the people of devastated Belgium, Serbia, Roumania, of northern France and northern Italy, about the American Red Cross. This organization has to its credit a glorious achievement unmatched in history. During the last year $100,000,000 was spent. Our Red Cross will ask us soon again for another $100,000,000 to help heal a bleeding world's wounds. Will you and I "come across" generously? Certainly we will! Through the Red Cross the United States is making friends for all eternity.
A Message From
BURDETT OXYGEN COMPANIES
The Bettendorf Oxygen Hydrogen Co.,
Bettendorf, Iowa
NATIONAL SERVICE
THE ART INSTITUTE OF CHICAGO

ONE of the best investments the people of the United States have made is the generous support given the American Red Cross in the last twelve months. Poor old suffering Europe today knows us as a great-hearted nation because of the magnificent work accomplished by our Red Cross over there. And for that, they will never forget us. Soon again we shall be asked by the organization for another $100,000,000 that this labor may be continued. We must see that the measure is filled to overflowing. —Just one more little individual sacrifice for the cause of humanity.

A Message from
UNIVERSAL OXYGEN CO.
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Portland, Oregon.

FREDERIC M. GRANT

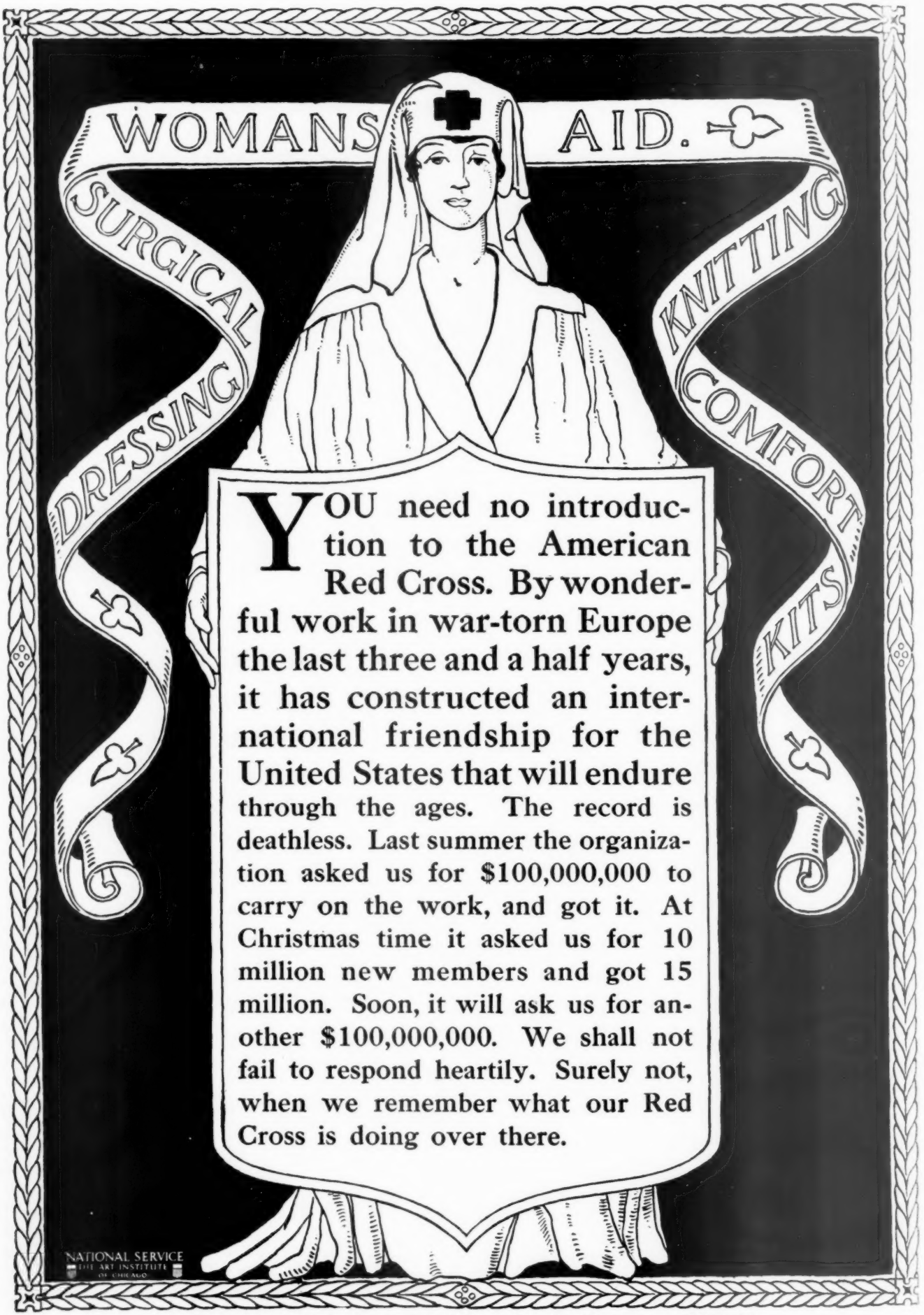
NATIONAL SERVICE
THE ART INSTITUTE OF CHICAGO

ANTHONY STUFFERS
FOR almost four years now, the American Red Cross has been the great agent of mercy and helpfulness everywhere in war-blasted Europe. It has made a glorious record that will last until the end of all things mortal, and has woven priceless ties of international friendship. Our Red Cross has spent $100,000,000 in the last year—perhaps the most worthwhile expenditure in all history. Shortly, we shall be asked for another $100,000,000 to carry on the labor over there another year. Every man and woman and child among us must give as freely as he can. This includes both you and me!
NATIONAL SERVICE

Our Business is mighty important to us, but we are more than glad to substitute for our message the message of the American Red Cross.

AMERICAN OXYGEN CO.
Cincinnati, Ohio.

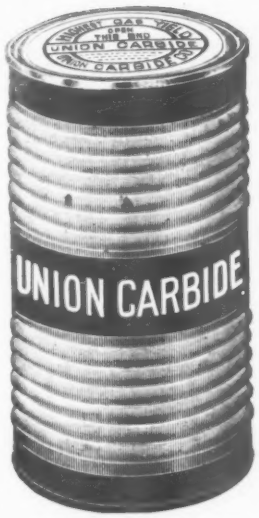
INDIANA OXYGEN CO.
Indianapolis, Ind.


WOMANS AID.
SURGICAL DRESSING
KNITTING COMFORT KITS
YOU need no introduction to the American Red Cross. By wonderful work in war-torn Europe the last three and a half years, it has constructed an international friendship for the United States that will endure through the ages. The record is deathless. Last summer the organization asked us for $100,000,000 to carry on the work, and got it. At Christmas time it asked us for 10 million new members and got 15 million. Soon, it will ask us for another $100,000,000. We shall not fail to respond heartily. Surely not, when we remember what our Red Cross is doing over there.
NATIONAL SERVICE
THE ART INSTITUTE OF CHICAGO

In cooperation with the American Red Cross this advertisement is published by

BURDETT OXYGEN CO.
Denver, Col.

KENTUCKY OXYGEN AND HYDROGEN CO.
Louisville, Ky.



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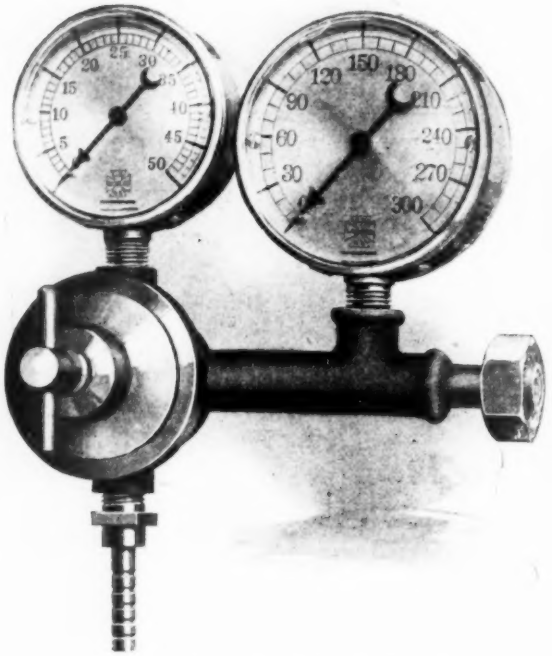

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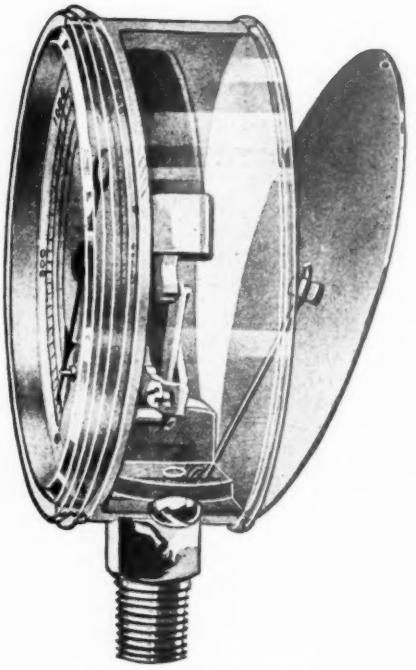

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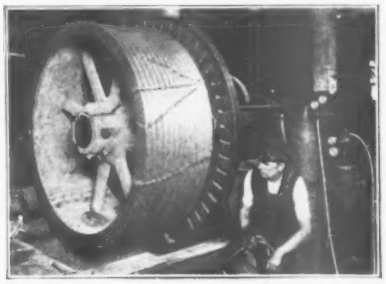

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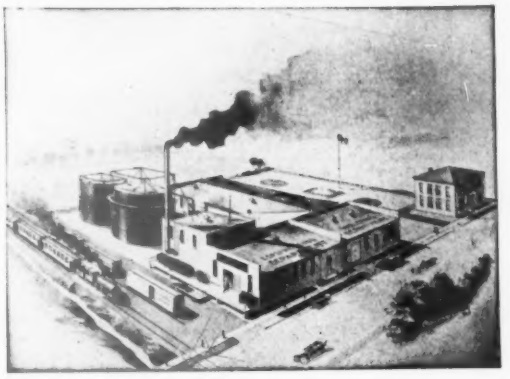

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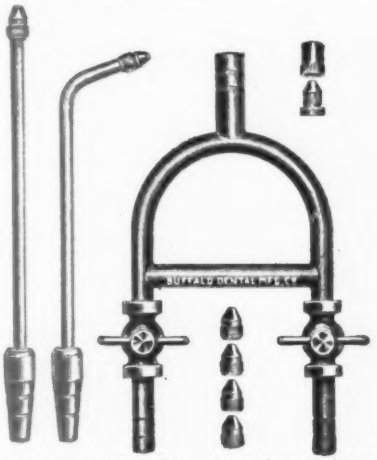

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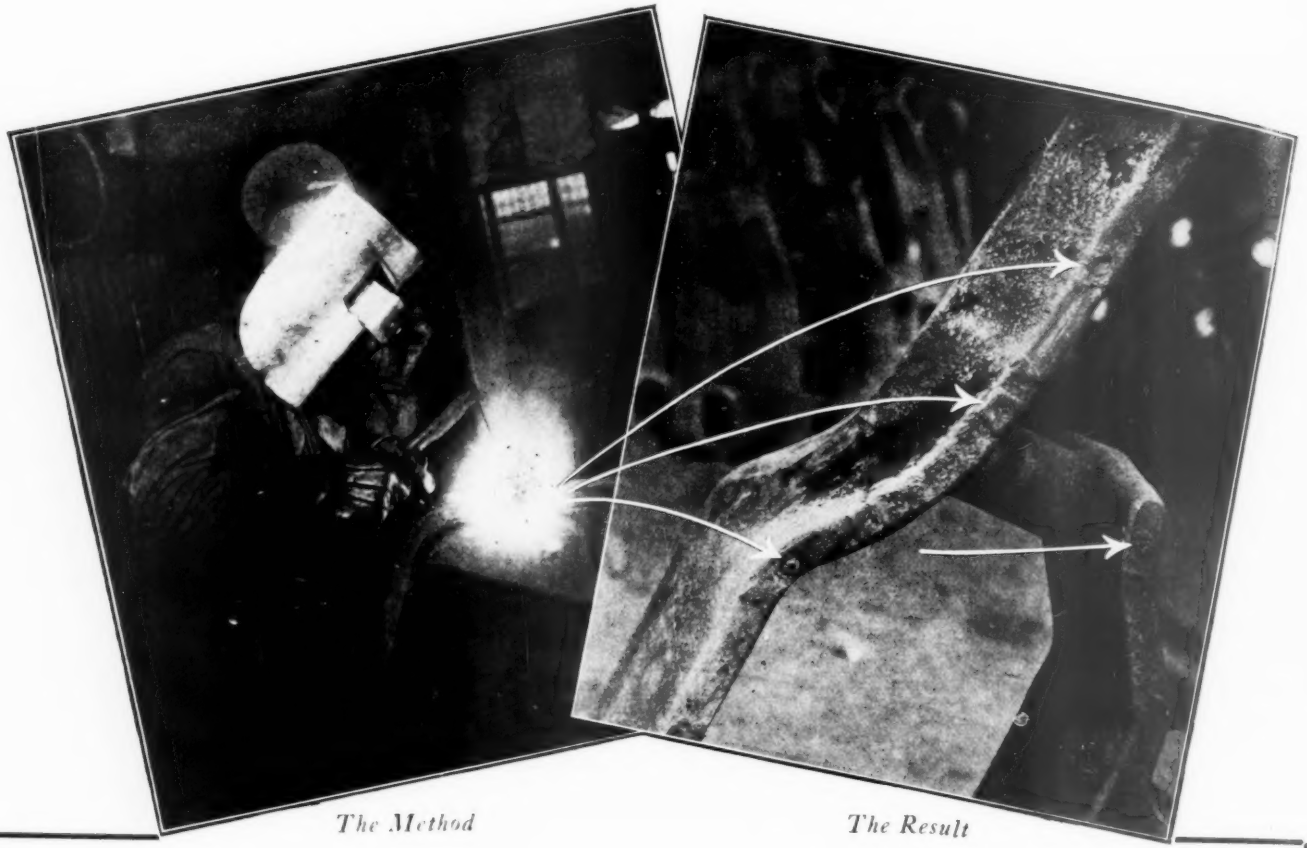

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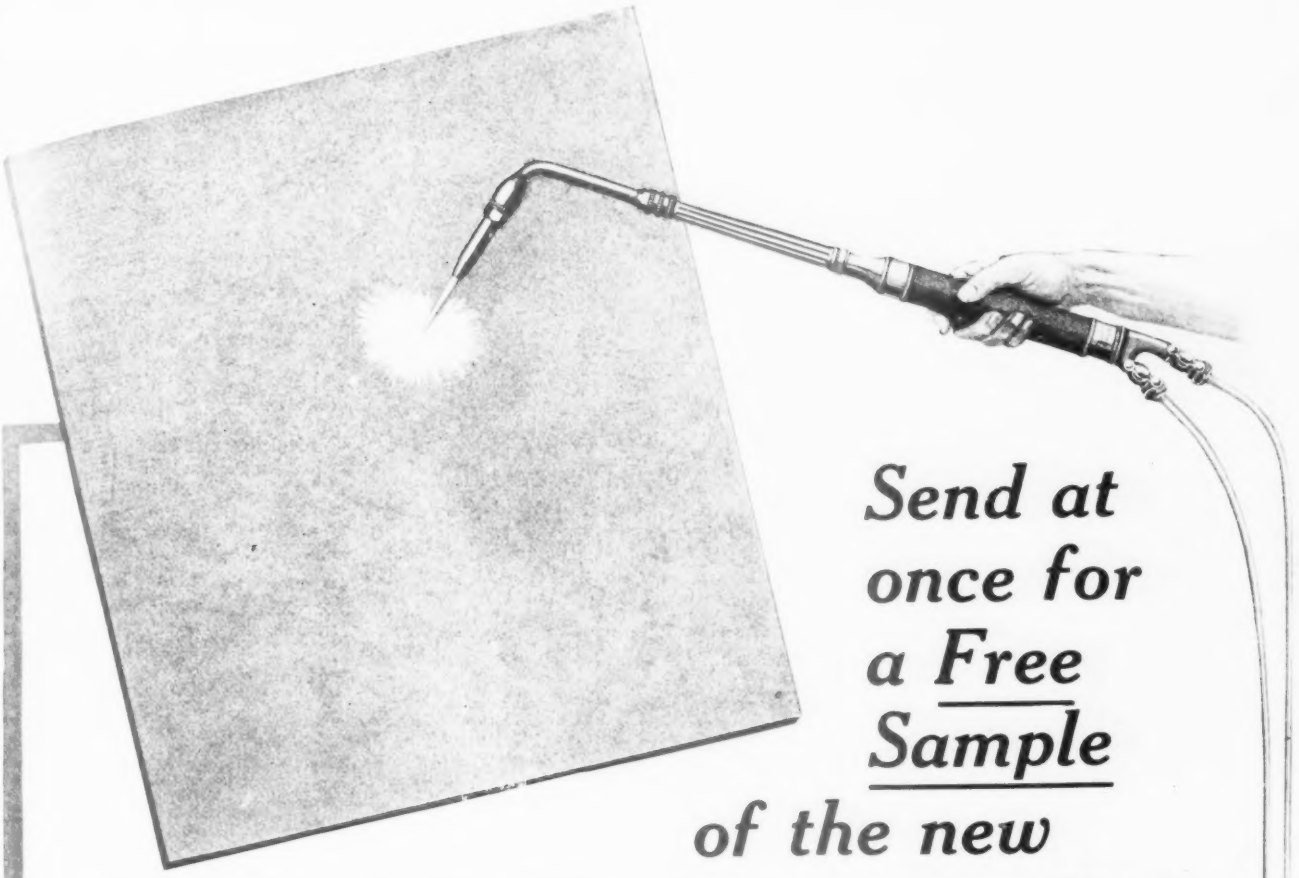

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By S. W. MILLER

287 Pages, 6 x 9 Inches, 192 Illustrations

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Ten years ago the oxy-acetylene method of welding and cutting metals was hardly more than a laboratory process, but in the course of these few years it has become one of the most important of the methods in the metal-working industries. Much has been published relating to this process, but a great deal of that which has been placed on record in the past has been descriptive of odd jobs. It is, therefore, believed that the present volume, dealing in a more systematic manner with the principles and practice of the art of oxy-acetylene welding, will be of considerable value to those engaged in the metal trades.

The information here presented on the subjects of oxy-acetylene welding and cutting has been mainly furnished by S. W. Miller, proprietor of the Rochester Welding Works, whose wide experience in the practical application of the process, and whose success in the work, vouch for the reliability of the information here placed on record. The experience of the author in the oxy-acetylene welding field has been unusually extensive, but having been mostly on repair work, he has written especially for those engaged in a similar line. A great deal of the work done with the oxy-acetylene welding torch is on repairs, and while there are also a great many applications of it in manufacturing work, such applications are more or less special in each case, and sometimes require a great deal of experimenting before success is attained. The general principles here presented, however, apply equally to repair and manufacturing work. This volume describes the equipment required for oxy-acetylene welding and cutting, deals in detail with methods used in welding cast iron, malleable iron, steel, copper, brass, bronze, and aluminum and gives in addition, special attention to the welding of sheet metal, tank welding, boiler repairs, etc., as well as to the subject of lead burning, which is a special kind of autogenous welding.

The book contains twelve chapters headed as follows:

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The ARMY LECTURE COURSE

Suggested Answers to a Series of Questions Used by the Army Welding School at Peoria, Ill. The Complete Series of 20 Lectures Was Published in the April Issue

Suggested Answers by Mr. S. W. Miller,
Rochester Welding Works

Editor's Note.—Questions published in April issue appear in italics. It is the opinion of the Editor that some of these questions were framed to trip up the unwary student. Lectures 4, 5 and 6 will be published in June.

Lecture No. 1—Subject: Operation.

1. (a) Under what pressure is Oxygen gas received in the cylinders used commercially?

Answer (a) About 1,800 pounds per square inch.

(b) Does this pressure vary to any great extent with changes in temperature?

Answer (b) Not very much. Oxygen changes in pressure about 1/460 for each degree F. change in temperature; so that a change from 70°F. to 100°F. would increase the pressure 30/460 or 6½ per cent. If the pressure at 70°F. were 1,800 pounds, the pressure at 100°F. would be 1,917 pounds; and at 0°F. 1,530 pounds.

2. (a) Under what pressure is Acteylene gas received in the cylinders used commercially?

Answer (a) About 250 pounds per square inch at 70°F.

(b) Does this pressure vary to any great extent with changes in temperature?

Answer (b) Yes. Acetylene does not follow a fixed law as does oxygen, but it has been found that a solution of acetylene in acetone (as it exists in acteylene tanks) increases in pressure from 180 pounds at 57°F., to 286 pounds at 97°F. If the same relation existed, at 0°F. the pressure would be only 62 pounds. Therefore, acetylene tanks should be protected from the heat and cold, and kept at a temperature of about 70°F.

3. (a) In setting up apparatus for the first time, or in attaching regulators to new cylinders, what precaution should be observed regarding cross-bar on regulators before the gas is turned on?

(Note.—It is presumed that this cross bar refers to the one passing through the head of the diaphragm spring adjusting screw. Some regulators have a different arrangement; for example, a hand wheel is sometimes used in place of a cross bar, and the question should be so modified as to make it cover all cases.)

Answer (a) The adjusting screw should be fully released, so there will be no pressure on the diaphragm spring. This will close the valve against the tank pressure, and prevent undue strains in the diaphragm.

(b) Where should the operator stand when turning on the gas?

Answer (b) He should stand so he does not face the dial of the high pressure gage, because if the tube in this gage should break, the full pressure would be turned into the body of the gage, blowing it up. Welders have lost their eyesight from this cause. The best gages are so made as to provide for this, but no chances should be taken. It is best to keep the face turned entirely away from the gage when turning on the valve.

(Note.—In case of oxygen tanks having valves of the Linde design, the valve should be screwed open hard to keep the oxygen from leaking out past the stem. Acetylene tank valves should not be opened more than two full turns.)

4. (a) How much pressure should be placed on the Oxygen hose, when the torch-valves are closed, before starting to operate with a medium sized tip?

Answer (a) Whatever the torch manufacturer calls for in his instructions for the tip in question. For instance, a Davis-Bournonville No. 5 tip calls for 10 pounds. An Oxweld No. 7, which is nearest the Davis-Bournonville No. 5, calls for 16 pounds.

(b) How much pressure should be placed on the Acetylene hose, when the torch-valves are closed, before starting to operate with a medium sized tip?

Answer (b) Whatever the manufacturer calls for. In case of a Davis-Bournonville No. 5 tip, 5 pounds. The Oxweld torch acetylene pressure is very low, and their regulators are not provided with low pressure gages; in such a case, turn the regulator adjusting screw down till a current of gas can be felt against the cheek with the torch handle valve open.

(Note.—One familiar with torch design can usually guess rather closely as to pressures, but so much depends on the sizes and arrangement of the passages, that care should be taken to get instruction from the maker, who will be glad to furnish them.)

It is well to state here that in torches of the Davis-Bournonville type, the oxygen should be shut off *first* when turning the torch out; and the oxygen should be shut off *last* in turning off torches of the Oxweld type. This will avoid flashing back.

5. (a) After both the Oxygen and Acetylene gases are in the line hoses as far as the torch, which valve on the torch is opened first in order to light?

Answer (a) The acetylene valve.

(b) What would happen if the other torch-valve were opened first?

Answer (b) Nothing, as the oxygen would not light. But if the end of the tip were plugged up, the oxygen would be forced back into the acetylene passages, and when the acetylene was turned on, it might cause a flash back.

In the April issue of The Welding Engineer, twenty lectures, as used by the Ordnance Corps, U. S. Army, Peoria, were published. The questions only were published, and the object of this article is to give our welder readers an idea of how a skilful welder would answer the questions. These answers have been prepared by Mr. S. W. Miller of the Rochester Welding Works, Rochester, N. Y., who is in the opinion of the Editor one of the leading Welding Engineers of this country. The next installment will appear in the June issue. The questions which are copyrighted by the U. S. Welding Co., Minneapolis, Minn. An article written by Lieut. Campbell, of this school, published in the March issue.—Mackenzie.

(c) What would likely occur if both valves were opened before torch was lighted?

Answer (c) A flash back, which might extend back into the hose and burst it, possibly injuring the operator.

6. (a) How is it possible, when lighting torch, to determine whether enough pressure is on the Acetylene line without looking at gage?

Answer (a) If the acetylene flame stands away from the tip from $\frac{1}{8}$" to $\frac{1}{4}$", the oxygen can be turned on, and more accurate adjustment then made.

(b) How is it possible, in the case of Oxygen pressure?

Answer (b) If the oxygen handle valve is wide open, and the flame is not neutral, the oxygen pressure is too low.

7. (a) What is meant by a neutral flame?

Answer (a) A flame in which there is no excess of either oxygen or acetylene, as judged by the eye. As the oxygen is gradually turned on, the long yellow acetylene flame becomes shorter and whiter, until there is is noticed an intense-

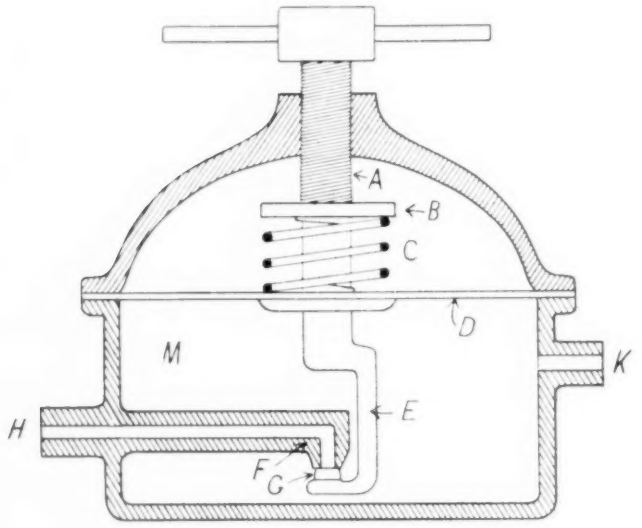

Fig. A. See Question No. 5, Lecture No. 2 (Page 17)

ly white, short flame just at the end of the tip, fringed with streamers of flame, also white. As the oxygen is still further increased, these streamers disappear, and just at the point of their disappearance, the short, white flame becomes very sharply defined. This is the neutral flame.

(b) How hot is a neutral Oxy-Acetylene flame?

Answer (b) About 5,000°F. (This is usually given as 6,300°F. The writer has endeavored to find authority for this statement, but has been unable to do so. The temperature of the oxy-acetylene flame has never been measured, so far as the writer knows, even with an optical pyrometer. Professor Richards gives 5,000°F. as the approximate actual temperature. 6,300°F. is the temperature of the positive crater of the carbon arc.)

(c) Is the temperature of a neutral flame the same whether large or small tip is used?

Answer (c) The temperature (or *intensity* of the heat) is the same; but the *quantity* of the heat is more in the case of the large tip.

8. (a) If too much Acetylene gas is used, how will the flame be effected?

Answer (a) The fringes above referred to will appear, and the sharp outline of the flame will be lost.

(b) What action will this have on the weld?

Answer (b) As acetylene is about 92 per cent carbon, the tendency is to carbonize the metal being welded. With cast iron and aluminum, this carbonizing has no detrimental effect. With steel, a noticeable excess of acetylene may make the weld harder and more brittle. In any case, the flame temperature is lowered and the welding becomes slower; so an excess acetylene flame should not be used.

9. (a) If too much oxygen gas is used, how will the flame be effected?

Answer (a) It will become shorter and take on a bluish tint.

(b) What action will this have on the weld?

Answer (b) It will make a heavy, white foam over the surface of the melted metal, lighter in color than the metal itself, and which will be included in the weld if great care be not taken. Also, the weld will be filled with very small specks of oxide of iron, which will make it weak and brittle. The excess acetylene flame is easily noticed, the excess oxygen flame is not; so that occasionally the flame should be tested by decreasing the oxygen or increasing the acetylene, and any needed adjustment made, until the flame is neutral.

10. (a) Explain briefly how apparatus is shut-off, when not to be used for several hours or more.

Answer (a) Shut off the cylinder valves; open the torch handle valves; release the regulator diaphragm springs, close the handle valves. Be sure the tank valves are shut off tight, to avoid loss of gas. If the regulators are to be removed from the tanks, test the tightness of the valves by wetting the ball of the thumb and placing it lightly on the outlet. If any bubbles appear, the valve is not tight. An acetylene leak can easily be found by the odor.

(b) Why should particular care be taken to see that Acetylene cylinders are tightly closed when empty?

Answer (b) Because acetylene mixed with air in the right proportions is explosive.

(c) What action does oxygen have on oils and greases?

Answer (c) It oxidizes them very rapidly; sometimes so rapidly that spontaneous combustion may occur, or even an explosion. Never use oil or grease of any kind around an oxygen pipe or tank. If lubricant is needed, use soap, and that sparingly.

Lecture No. 2.

SUBJECT—APPARATUS.

1. Name the different classes into which Oxy-Acetylene welding apparatus may be divided and explain the principles upon which this classification depends.

Answer (1) (This depends on the basis of classification, which may be the usual one of the acetylene pressure, or the design; for example, whether the gases are mixed in the tip, the head, or the handle. The former is generally considered a matter of principle, and is the one the writer will use.)

The so-called "injector" type of torch, of which the Oxweld is an example, uses a very low acetylene pressure, it being only a few ounces.

The so-called "medium" or "positive" pressure type of torch, uses an acetylene pressure up to 6 pounds; these pressures being measured at the regulator. Either of these types may do the mixing at the tip, head, or handle.

2. Illustrate by line sketches the various locations of the mixing chambers for the Oxygen and Acetylene gases in welding torches.

Answer (2) Take sketches from "Oxy-Acetylene Welding," by S. W. Miller—Davis-Bournonville, Oxweld and Prest-O-Lite.

3. (a) Where is the logical location for the mixing chamber in welding torches employed in automobile and tractor repair work?

Answer (a) This is a matter of opinion, and cannot be decided in favor of any one location. The writer cannot see that the kind of work has any bearing on the matter.

(b) Give reasons for so thinking.

Answer (b) The writer does not believe that his own, or any other person's opinions on this or similar matters should be final. There is no question but that good work is done in automobile and tractor repair work with all types of torches. This being the case, the question is superfluous, and should be omitted.

4. How is the torch and the welding treated after repeated "flash-backs" have taken place?

(The question is not clear.) Flash-backs result from various causes, and, of course, the cause should be removed. If after a number of flash-backs, the flame appears weak, probably some of the small passages are plugged up with soot, and should be cleaned out. If the tip is hot, it should be cooled off.

No effect of flash-backs on the welding (if this means the work being done) is known to the writer, except that a crater may be formed. If this is what is meant, the metal around the crater must be heated up till it and the bottom of the crater are hot enough to unite.

5. Describe briefly the working principles of a regulator and illustrate with a simple sketch.

Answer (5) The high pressure gas enters at H through the nozzle F, into the chamber M. The yoke E, which is fastened to the diaphragm D, and has on its lower end a seat S to close F, is held down by the pressure of the spring C, which has been compressed by the adjusting screw A acting on the washer B; so when the gas pressure in M is sufficient to equal the spring pressure, it will push up the diaphragm, and with it the yoke, and the seat S will close the nozzle, shutting off the supply. The gas, at reduced pressure, passes out through K. As the gas in M is used up, the process is reversed. (See sketch—Fig. A, Page 16.)

6. Explain the difference between high and low pressure regulators.

Answer (6) This question is also not clear. Is the pressure referred to the tank pressure, or the reduced pressure? In any case, there is no need for any difference, except that an oxygen regulator should not be made of any brittle material, like cast iron, nor contain any iron or steel, as corrosion must be avoided. An acetylene regulator may be made of cast iron.

The writer knows of one make of regulator in which the only differences are the tank pressure gauges, the tank connecting nuts, the hose connections, and that the body of the oxygen regulator is a brass alloy, while that of the acetylene regulator is cast iron.

7. (a) Can Acetylene regulators be interchanged with Oxygen regulators with perfect safety? Explain why.

Answer (a) Not as they are furnished. The acetylene tank gauge is generally not strong enough to stand the oxygen pressure.

(b) How is it possible in majority of cases, to distinguish in a very simple manner, between Oxygen and Acetylene regulators, when no gauges are attached?

Answer (b) The tank connection nuts are different. The Linde connection is 29/32 inch diameter and has 14 threads per inch. The Prest-O-Lite tank connection has a left-hand thread. Other acetylene tanks have 13/16 inch, 14 thread connections, and all acetylene regulator nuts are made this size, as far as the writer knows, a special adapter being used for Prest-O-Lite tanks.

(c) Why does this difference exist?

Answer (c) To prevent interchange of the regulators.

8. (a) Why should all tension upon diaphragm springs be removed before admitting gas under pressure to the regulator?

Answer (a) To prevent a sudden opening of the tank valve admitting enough pressure to overstrain the diaphragm, and cause it to buckle.

(b) Can a regulator which has been abused in this manner be repaired?

Answer (b) Yes. By renewing the diaphragm.

(c) What can be employed as a fitting substitute for Galalith?

Answer (c) Nothing the writer knows of is as good. The material mentioned is nothing but horse hoof. It cannot now be obtained. Hard rubber and fibre are used instead.

9. Explain why the high pressure gauge on the Acetylene regulator cannot be used as an index to the contents of the attached cylinder of gas in exactly the same manner as the Oxygen high pressure gauge.

Answer (9) Because of the conditions mentioned in the answer to question 2-B; that is, because a slight change in temperature makes a great difference in the gauge reading.

10. Why is glycerine used as a substitute for oil when regrinding torch valve-seats with emery powder, and with Lead-Oxide in the caulking of leaky joints along the line?

Answer (10) The idea is that oil is dangerous when oxygen is brought in contact with it, as explained in the answer to question 10-C.

Emery is a poor material to use for grinding brass valve seats, as it tends to cut and groove the seat; ground glass is far better. Also, no leaky joint should be caulked. It should be taken down and repaired properly. If the pipe was put up right at first, a leaky joint is evidence of a badly corroded pipe, which is dangerous and should be repaired right—not patched.

Lecture Number Three

SUBJECT—WELDING OF CAST IRON

(Part One)

1. (a) How is it possible to distinguish cast iron from such metals as malleable iron?

Answer (a) (The question should ask how to distinguish cast iron from malleable iron, as there is no other metal like malleable iron.) Malleable iron is tough, and a small chip from the edge some place breaks off with more difficulty than a similar chip from cast iron. Also the small iron chip will flatten out quite a little without breaking, while the cast iron chip, when hammered, breaks up easily. Another test is made with the torch by melting a small part of the piece. Malleable iron usually melts more like steel on the outside, farther in the melting seems to cause holes in the metal, while in cast iron, it does not. The writer believes the former test the more certain.

Also, one familiar with castings can tell by the smoothness of the cast surface that it is malleable iron, as there is no sand left; while cast iron frequently is rough, on account of the sand; this is not always true.

If the piece is broken, the short fracture, and the fact that the pieces fit well together, show cast iron. Malleable iron is tough and the edges of the broken pieces do not fit together, as the material has stretched, somewhat like steel, but not so much.

(b) From semi-cast iron?

Answer (b) (This is the first time the writer has heard the term "Semi-cast iron," and thinks that what is usually called "semi-steel" is what is referred to. This is cast iron, to which has been added, in the cupola, about 15 per cent of steel. The result is an increase of the combined carbon, making the metal stronger and tougher.) There is no way of distinguishing it from cast iron, as they are both cast iron. (Moldenke says that the same results can be obtained by a suitable mixture of cast irons, and the writer ventures to agree with him.)

(c) From cast steel?

Answer (c) Cast iron cannot be welded with steel wire, and a steel casting (the correct name) can be. Cast iron will melt before the steel wire will, and an attempt to add the wire will not be satisfactory. Also, cast iron does not solidify as rapidly as a steel casting, and melts more easily. The surface of a steel casting is much rougher.

2. (a) What kind of metal is used in making "filler-rod" used in the welding of cast iron?

Answer (a) (It is presumed that silicon is referred to, so the question should be altered to something like this: What material is an essential element of cast iron welding rods?) Silicon in larger amount than usual in cast iron; from 3 to 3½ per cent being necessary.

(b) What general rule can be laid down as to the relation of the metal in the "filler-rod" to the metal to be welded?

Answer (b) (The question is rather indefinite.) The metal in the welding rod should have a melting point no higher than the material being welded, and preferably somewhat lower.

3. (a) What are the characteristics of good cast iron "filler-rods"?

Answer (a) They must melt easily, flow freely, and be free from sand or dirt inside or out, and must make a tough, strong, soft weld.

(b) Can piston rings and other small scraps of cast iron be used successfully as "filler-rods"? Explain why.

Answer (b) No. Because they are not of the proper chemical composition to meet the requirements of (a).

4. (a) What is the purpose of a flux?

Answer (a) To combine with the oxides and other impurities in the iron, so as to form an easily fusible slag; this allows the metal to run together easily, and makes a clean weld.

(b) Is a flux used in the welding of cast iron?

Answer (b) Yes. A flux is necessary because oxide of iron melts at a higher temperature than cast iron.

5. (a) Name one formula for making a cast iron flux.

Answer (a) Equal parts of carbonate of soda and bicarbonate of soda thoroughly mixed.

(b) How often is the flux applied, and by what means?

Answer (b) Just enough is used to keep the metal flowing freely, and is applied by dipping the hot end of the welding rod into the flux.

(c) In what condition are fluxes kept when not in use?

Answer (c) In a clean dry place.

6. (a) How should the flame be held in the welding of all cast iron?

Answer (a) With the tip of the white cone close to, but not quite touching the welding rod, near the metal being welded; there will be enough heat from the envelope flame to keep the original material melted, and as the rod should be kept in the melted pool, a good union will be made.

(b) When and how is the "filler-rod" added to the weld?

Answer (b) The filler rod should be added continuously, and a large pool of melted metal maintained. Whenever the pool becomes higher than the surrounding colder portions, the flame should be played around the edges, till a thorough union is obtained.

7. (a) Name the one principal cause of blow-holes and hard spots in the weld.

Answer (a) (The writer does not believe that blow-holes and hard spots have the same cause, so he gives his views as to the causes of each.) Hard spots in cast iron welds are caused by some of the metal being brought to a high temperature, but not melted, and cooled rapidly. Cast iron welding rod, heated to a bright red, and quenched in water, will be found hard, although with ordinary rates of cooling, it will not harden, because of its high silicon content. So that, unless the cooling is very rapid, the hard spots are not *in* the welds, but at the junction of the weld and the original, which, being lower in silicon, will chill even though its rate of cooling is but little less than that of the weld. Really, the original material cools more rapidly than the weld, because it is never heated so hot, and because the colder metal conducts the heat from it first. Hard spots are really chilled iron, the same as in car wheels, in which the tread is almost glass hard, while the centers are soft and easily machined. The treads of these wheels are cast in a heavy form of iron, called the "chill," while the centers are cast in sand. It may be of interest to note that, in order to relieve the strains, due to the sudden contraction caused by the chilling, the wheels are taken from the molds before cooling, and placed in the annealing pits, and kept there at a dull red heat till the strains are removed. *This does not soften the chill*, and explains why hard spots in welds cannot be removed by simply heating to a red heat.

Blow-holes in welds are always caused by gases; the causes of these gases are generally two: either the welding rod is added too soon, and the gases from the pores of the original material are not alowed to escape, or a small speck of foreign material, frequently sand from the rod, and carrying with it a small amount of air, is imprisoned in the weld. The remedy for the former cause, is to heat sufficiently before adding material, and for the latter, to burn down to the bottom of the hole and melt underneath the speck of dirt, which will rise to the surface, when the blow-hole will have disappeared.

(b) Mention some of the others.

Answer (b) The answer to (a) gives the real cause of hard spots. They may appear due to other causes; for example, in building up a tooth in a gear wheel, if the face of the tooth is smoothed off with the torch, the face will usually be very hard; but this is due solely to the rapid cooling of the heated metal.

Sometimes the use of too much flux, when finishing a weld, will leave a thin, hard scale; but this is readily removed by rubbing an old file on it while still hot, and is not a true hard "spot."

8. (a) When is it advisable to grind, or "V" out, the ends of the pieces to be welded?

Answer (a) Always, with the exception given in (b).

(b) When is it not advisable?

Answer (b) When it is difficult to line the piece up, if it were V'd out; this is an unusual condition, an instance being a crooked lever, with no finished surfaces. Even in such cases, a little ingenuity in setting up will usually make it pay to grind or by other means produce the V.

When the cost of grinding or chipping out the V would be excessive; for example, in automobile cylinder jackets.

9. (a) Does the application of heat cause contraction of expansion in metals?

Answer (a) Expansion.

(b) Are there any excepts to this rule? Name one.

Answer (b) (The writer does not recall any exception to this, except in the case of a certain nickel-iron alloy, containing a high percentage of nickel, which is used for making surveying tapes, and which, at ordinary atmospheric temperatures, may be said to have practically no expansion. It is called invar. If this is what is referred to, it would hardly seem to have any bearing on welding.)

10. (a) Were two cast iron bars measuring 2x12 inches and ½-inch thick, to be welded, end to end, what precaution should be observed in laying out, if the finished job is to measure just 24 inches long?

Answer (a) They should be separated a slight amount; in other words, before welding, the distance from end to end should be slightly more than 24 inches.

(b) In what respect would this problem differ were the bars only 6 inches originally and the finished job to measure 12 inches overall?

Answer (b) None.

(c) Is the action of the metal in the weld a constant, or a variable quantity depending upon the length of the bar in the problem?

Answer (c) A constant.

Note.—Answers to Lectures Nos. 1, 5 and 6 will be published in the June issue.

Who's Who

GRANJON AND ROSEMBERG.

Probably no two names in the welding industry are more frequently quoted than our esteemed French allies, Granjon and Rosemberg. Some few years ago their book "Autogenous Welding" made its appearance in the United States, being translated into English by our other ally, Captain D. Richardson, Royal Flying Corps. Although the first edition was written some years ago (four editions have now been printed) the book is still considered the leading authority on the subject.

Brief biographical sketches follow:

Raphael Granjon was born at Saint Etienne (Loire) in 1878, director of the Central Acetylene office (office Central de L'Acetylene), general secretary of the Autogene Welding Union, member of the Committee of the French Acetylenists' Union, Director of the Lighting Review (Revue des Eclairages), of the Welding Engineer Review, and since the war, of the Acetylene Bulletin, and of the Welding Engineer.

Raphael Granjon.

In the year 1897, he founded at Marseilles the journal The Acetylenist, afterwards the Lighting Review (Revue des Eclairages) (1905), published in collaboration with Mr. Pierre Rosemberg, from 1907 to 1912, L'Annuaire International de L'Acetylene (International Acetylene Annual): Le Manuel Pratique de Soudure Autogene (The Practical Welding Autogene Manual), and numerous brochures for general distribution. He participated in the organization of the International Acetylene Congresses of Paris (1900), Liege (1905), London (1908), Vienna (1913), Rome (1913).

Pierre Rosemberg was born at Tours Indre et Loire in 1869. Director of the Central Acetylene Office, secretary of the Autogene Welding Union, secretary (since 1900 of the French Acetylenists' Union, director of the Revue Des Eclairages (Lighting Review), of the official organ of the Welding Autogene, and, since the war, of the Acetylene Bulletin, and of Welding Autogene (Engineering*).

Pierre Rosemberg.

In the year 1901, he founded the General Acetylene Review. From 1907 to 1912 he published in collaboration with M. Granjon, the International Acetylene Annual, the Practical Manual of Welding Autogene, and numerous brochures of a general character. Assistant Secretary of the International Acetylene Congress (1900 Paris), Liege 1905, London 1908, Rome 1913.

*(*Autogene is a compound word, may be translated Engineering, depending on the particular usage made.)*

OTIS ALLEN KENYON.

Mr. Otis Allen Kenyon is the chief engineer of the Arc Welding Machine Co., Inc., New York, N. Y. He was born at Baldwinsville, N. Y., November 19, 1879.

He became interested in electric welding in 1910 and began to look up the subject, especially the patents. Was employed by Joseph Enderlin Sons as expert in a suit brought against them by Siemend & Wentzel for alleged infringement of certain patents. Enderlin won the suit and the judge in his decision virtually quoted his testimony. As a result of his success in this suit he was employed by The Electric Welding Co., of New York, as consulting engineer and later gave them his whole time, being employed as electrical engineer. During the time that he was with the Electric Welding Co. they grew from a small concern, with only one floating plant, to a concern of international reputation. Their work was and still is repairs of all kinds by arc welding. The experience there gained covered a very wide range: boiler repairs, all kinds of

Otis Allen Kenyon.

broken machinery, on board ship and on land. During this period they welded the steel lining of the Catskill Aqueduct, which was the biggest welding job ever undertaken up to that time and was not approved by the New York Board of Water Supply until they had made exhaustive tests. It was at this time that he evolved the equivalent arc, which was used with portable controllers on constant potential circuits. Later on he took up the study of the heat characteristics of the arc and experimented with relays for limiting the length of the arc and as to prevent overheating. These experiments on constant potential circuits led to the desirability of using constant cur-

rent, and then a couple of years were spent in trying to build a generator that would furnish a current sufficiently constant to permit the operation of arcs in series. Finally a commercially practicable system was evolved and put on the market, and the Arc Welding Machine Co. was organized to exploit it. The constant-current closed-circuit system is specially adapted to manufacturing because it is susceptible of such a high degree of heat control.

He has taken out twenty-one patents on heat control and automatic welding, the first one of which covers basically the operation of welding arcs in series. He is at present engaged in working out important welding installations in connection with the goverment war plans and therefore is not at liberty to say anything further than it involves the use of arc welding on a heretofore unprecented scale, and on metals that are usually considered too thin to weld by this process.

During the last four years he has been almost continuously carrying on investigations and tests of arc welding in connection with the development of plants for special manufacturing purposes.

His previous training was that of an engineer. He finished high school at Baldwinsville, then studied one and a half years

Charles A. McCune.

in Paris, France, after which he returned to the United States and entered Cornell University, where he secured a degree of mechanical engineer. From Cornell he went to Berlin, where he studied two years in the Royal Technical School in Charlottenburg. His first job was with the Railway Test Commission at the St. Louis Exposition. He next went with the McGraw Publishing Co. as editor of technical books, and while with them he produced the Standard Handbook for Electrical Engineers. He is a member of the welding committee of the Emergency Fleet Corporation.

CHARLES A. McCUNE.

Charles A. McCune, for twelve years connected with the Commercial Acetylene Co., of 80 Broadway, New York, has resigned to accept the position of sales engineer with the Page Steel & Wire Co., of 30 Church street, New York.

Mr. McCune was born in Jersey City, N. J., in 1879 and before entering the acetylene field was for several years connected with the Safety Car Heating & Lighting Co., whom he left in 1906 to take up the duties of assitant engineer with the Commercial Acetylene Co. and since then has been actively engaged in everything pertaining to this industry, his work in the greater part being devoted to the development and application of dissolved or compressed acetylene with utmost success.

One of his noteworthy achievements is worth recalling at this time when he threatens to leave this field:

In 1908 he perfected the first successful inverted acetylene burner and mantle for railroad car lighting purposes; this system being partly used on the D., L. & W. R. R. until a few years ago when the road practically went over to electric lighting.

Several systems of acetylene mantle lighting have been developed in the last twenty years but none of the injector systems for acetylene mantle lighting enjoyed such a proud record as the McCune system.

In 1916 Mr. McCune became chief engineer of the Commercial Acetylene Co. and although he will be missed in the active acetylene field, it is certain that "ARMCO" welding wire will still keep him close to his old friends. In his new position he will look after, among other things, a very important branch of welding, namely, the wire or "filler rod," and we wish him the same success in his new enterprise as he attained in the acetylene industry.

Mr. McCune will be succeeded by Mr. David Ahldin, who was formerly engineer of the A-G-A Co. and also the Commercial Acetylene Railway Light & Signal Co.

WILLIS PRINTS SECOND EDITION.

A second edition of "Oxy-Acetylene Welding and Cutting" has been published by P. H. Willis, of the Henderson-Willis Welding & Cutting Co., St. Louis, Mo. This little book; which consists of 181 pages is a very thorough treatise on the art of welding and cutting. Mr. Willis, one of America's pioneer welding engineers, has contributed to the literature of the trade a very interesting and helpful text book. It is full of useful information and suggestions and should be in the possession of every welder. The price is 50 cents, postpaid.

NEW WELDING BRONZE.

A new bronze, the product of a Milwaukee manufacturer, bids fair to do much to advance the cause of welding. The new product is known as "Litnum Bronze," and it makes an ideal rod for welding cast iron, malleable iron, bronze or brass. By using Litnum Bronze small castings may be welded without preheating, with very satisfactory results. An experienced operator recently welded an automobile cylinder, having a three-inch crack, in ten minutes, without preheating. This new metal possesses great tensile strength and ductility, which is of great importance to the welder. The saving of both time and preheating fuel is a point which will attract welders and "Litnum Bronze" should be welcomed by the welding trade.

THOMAS H. DUFFY.

Thomas H. Duffy, former Western Manager for the Commercial Acetylene Supply Co., Chicago, is now Corporal Duffy 312 Inf., Camp Dix., N. J. Corp. Duffy is attached to the Headquarters Co.

ANNOUNCEMENT EXTRAORDINARY

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The welding trade will soon be revolutionized by our Litnum Bronze welding metal and our Litnum process of welding because of its simplicity, economy and promptness, with no possibility of warping.

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Litnum Bronze is an acid-resisting metal and will stand a high melting point. The one metal will weld cast iron, malleable iron, brass, bronze and steel. Use only Litnum Flux. Good also for welding all metals. One metal, One Flux, One Process, a great convenience.

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Let Us Figure On That Big Job *Welding and Cutting Experts* Our men are first-class mechanics. We guarantee their work. *Correspondence Solicited* **Portage Welding Co.** Portage, Pa.	2 Inch Space. Cost Per Year $40.00.	
		Larger Spaces may be had if desired, the cost being $20.00 Per Inch Per Year.

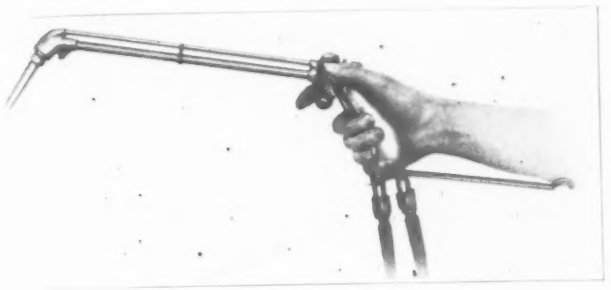
Note The above page represents a new department to be included in the Welding Engineer. If you are interested write me, L. B. Mackenzie, 608 S. Dearborn Street, Chicago.

A NEW WELDING TORCH.

of the best known designers of welding apparatus, Mr. H. Smith, a practical welder of many years' experience, fected a torch which is in many ways unique.

laces the entire control of the flame in the hand that is the torch. The oxygen and acetylene are controlled by st finger and thumb, working on trigger. The flame is by a pilot light which makes it possible for the operator e the torch from its hook, light and adjust the flame, t employing the other hand at all, and have the torch for work inside of two seconds.

This torch is designed to save time in as many ways as possible. The tip and the hose connections are equipped with Bronch lock threads which allow the operator to disconnect them with a quarter turn. You can change tips easily in five seconds. The pistol grip feature means great comfort for the operator, particularly on long jobs, because in connection with the



arm rest the torch becomes wonderfully easy to hold and unusually convenient to handle.

The efficiency of the torch is greatly increased by the fact that such tip contains its own mixing chamber which is exactly the right size to produce the best results for that tip. The danger from back-firing is eliminated by the check valves in the grip which protect both hose lines and make it impossible for the lighted gas to back up into the cylinder or generator and cause an explosion. The hose lines are equipped with automatic shut-off valves which close the line when detached from the pistol grip.

All the valves in the torch are interchangeable. They are extremely sensitive but very simple and of small cost. By reason of the valves in the pistol grip which control the gases, both gases are adjusted at the same time and a neutral flame is maintained.

In an emergency the operator may shut off the acetylene and convert the torch into a cutting torch by increasing the oxygen pressure without so much as laying the torch down, and can reconvert it into a welding flame at the touch of the finger.

In economy this torch is remarkable because of its many time-saving features. The pilot light enables the operator to put the torch out when for any reason he has occasion to lay it down to use both hands on his work. This results in a considerable saving in gas in the month's work.

Another point of economy, perhaps more important, is: that this torch will work on from ½ lb. to 1½ lbs. acetylene pressure, which means that many tanks which are thrown aside as empty by operators using other torches will operate the Smith's pistol grip torch for as much as a half an hour longer than any other torch, a result which is gained by the method of introducing the gases into the tip.

NEW IMPERIAL CATALOG.

The Imperial Brass Manufacturing Co., of Chicago, have issued their latest Imperial Catalog, No. 142, which describes in detail the full line of Imperial welding and cutting equipment and Imperial burning and lead burning outfits.

In this catalog is reviewed the history of welding and cutting and its relation to the metal industries, dwelling particularly on the present day necessities in that respect. All the various industries which use welding and cutting equipment are listed, together with a detailed account of the many ways in which Imperial outfits may be utilized.

Five points of superiority in which Imperial equipment excel are analyzed—Safety, Practicability, Durability, Economy and Portability. The famous Imperial mixing principle is also thoroughly explained.

Several different sizes of Imperial outfits are illustrated and described fully, while all the various parts and accessories are also cataloged in a thorough manner. The last four pages contain photographs and descriptions of work done and give a comprehensive idea of the wide range of uses for Imperial welding and cutting equipment.

Imperial Catalog No. 142 will be sent free to any one of our readers writing the Imperial Brass Manufacturing Co., 1200 W. Harrison street, Chicago, Ill.

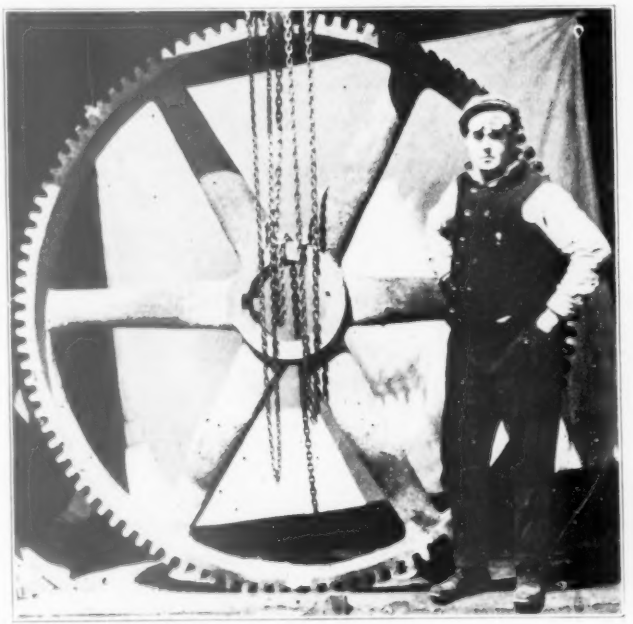
INTERESTING PAMPHLET ON CAST IRON WELDING RODS.

Many people do not realize the importance of exercising the greatest care in the selection of cast iron welding rods to be used for the oxy-acetylene welding of cast iron. Bearing this in mind, the Davis-Bournonville Co. have issued a four-page pamphlet which contains much information that will be of interest to the welder as well as to the buyer.

A copy of this pamphlet may be obtained by writing to the nearest sales office of the Davis-Bournonville Co.

CAST IRON GEAR WHEEL.

The cast iron gear wheel shown in the illustration was broken in three places at the rim. The weld was made by Louis Housfeld, Elkhart, Ind. The size of the gear was



8 ft. in diameter, the rim being 10x3 ins. This break caused a paper mill to shut down. The welds were preheated at the rim only and welded one on each end, then the spokes were preheated and the middle weld made.

ELECTRIC WELDING MANUAL.

A new text book on the subject of electric welding has been published by the Wilson Welder & Metals Co., Inc., New York City. The book describes the Wilson system of welding and cutting with the electric arc. There are many illustrations of equipment, preparation of the work, etc. Much valuable data, tables, etc., are given, together with information welders need.

THE WELDING OF CARBON TOOLS.

By B. Kopferschmidt.

Beyond the commonly accepted field for the welding shop, there is an equally great field in welding broken tools.

As generally understood, a tool maker is a machinist who has a greater knowledge of the trade than is simply sufficient to enable him to make such parts of machinery as may be the regular product of the shop in which he is employed. The same theory is applied to a tool welder. In order to acquire any degree of success the tool welder must not only be able to understand how to weld, but he must also know the physical and chemical properties of the steel that he may attempt to weld.

Generally, the welder has to deal with tool steel, high carbon steel, high speed steel and stellite; which all contain more or less carbon. Carbon is the element in steel that makes it possible to harden it by heating to a red heat and plunging into a cooling bath. It increases the tensile and compressive strength, but with the increase of this element it decreases malleability and welding power. Therefore, one has to be very careful not to destroy the carbon element, and to give it the proper hardening. Improper hardening after the welding is performed has caused more failures than improper welding.

Our metallurgists tell us that we must not heat a piece of steel hotter than necessary. Furthermore, the heat applied, varies with the make of the steel, the amount of carbon it contains, the size and shape of the tool, and the purpose for which it is to be used. Therefore, when one employs the oxy-acetylene flame to join carbon steels, one must be very careful to avoid unnecessary heating or fusing and not only preserve the carbon elements in the steel, but add carbon at the welding joint.

There are at present three methods in use to reclaim successfully broken tools or to join small pieces of high speed steel or stellite to low carbon shanks: oxy-acetylene welding, electric butt welding and oxy-acetylene brazing. Each process has its own field and advantages.

If the oxy-acetylene blowpipe is applied for welding, one must expect at the joints and its vicinity of the tool a coarse grain. This is due to the high temperature of heat used in fusing the edges to be welded and produces what we call overheated steel. However, this defect does not limit the application of the blowpipe in this field, but it simply requires a little study to join these metals successfully.

If one has to build on new material to replace a broken shank of a drill, tap or reamer, very little success can be accomplished by simply building on new material on top of the fracture, as the new shank will break off at the first or after a few operations in the machine. The best process the writer has obtained is to braze a new shank as per following method: Cut out a slot or a hole on the center of the fractured end about ¾ inch deep and the width should correspond with the size of the shank as per figure 1. Then make a new shank about ¾ inch longer. Then heat the fractured end of the tool slow and uniform, so as the edges and corners will be no hotter than the center, to a cherry red and brassplate the edges around the slot or hole, using pulverized borax and tobin bronze red; the same operation should be done to the new shank and when both are hot, force the shank into the slot or hole and sweat them together with the blowpipe, applying a little more brass and borax around the edges on both sides.

If the tool is broken below the shank, it is necessary to cut the fractured ends into a 45 degree V, male and female, as per figure 2. Then brass plate both ends and sweat them together as explained above. If the break is too near the cutting edge, then it is necessary to apply wet waste or, better, place the tool vertical in a cup of water, to prevent the tool from overheating. This method will, of course, shorten the tool and if this is not desired, then a slot should be cut at each end of the tool and a piece of steel sweated in with brass, as per figure 3.

If one has to weld a crack on or near the shank, the brazing process offers the best method for joining the crack permanently. Heat the shank around the crack slow and uniform, by turning the tool around continuously until the steel becomes a bright red; then sprinkle a little superior brazing compound. If the tool is heated uniform throughout the center, then this compound, that acts like a cleannig flux, will dissolve and run into the crack, which is absolutely necessary. Then heat again to a bright red and apply the Tobin bronze rod, dipped in the compound, on the surface of the crack. The molten brass will follow the compound and join the fracture solidly. Care should be taken to keep the cutting edge cool with wet waste or water. When work of this kind is to be done in larger quantities, the above method is a little slow. A better and less expensive method is to employ a small jeweler's crucible and to melt with the aid of the blowpipe some small lump brazing spelter, and when the latter is all melted to a fine liquid and the shank preheated to a bright red, dip the fractured end of

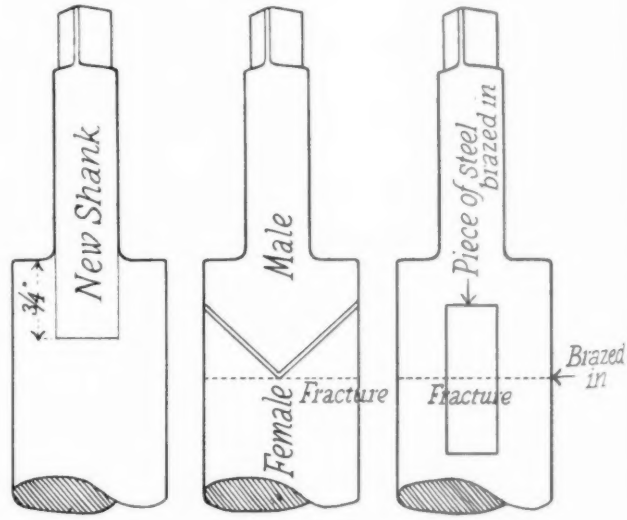


Fig. 1 Fig. 2 Fig. 3

the tool into the molten brass and add a little of the superior brazing compound. If the brass in the crucible begins to freeze, then play the blowpipe flame, and after one minute the tool may be removed from the crucible and the next one dipped in. With this brazing process one avoids the overheating or fusion of the steel which tends to change the molecular structure or to destroy the carbon element which is indispensable to the steel. The borax can be employed as a flux for all brazing of tool or high carbon steels; but for tungsten or high speed steel it is necessary to employ the superior brazing compound.

The method of welding a piece of high speed steel into a low carbon shank; it is necessary to preheat the piece in a forge and be sure that the air from the blast does not strike it. When it becomes cherry red, build on about ⅛ inch or more of nickel steel rod and use the superior brazing compound for a cleaning flux. During this operation the low carbon shank should also be preheated to a cherry red on the end where it is to be welded. Then high speed steel should be clamped to the shank and welded on all sides with the same rod but without flux.

Much of the success of these welds depends on the way the tools are hardened. Tools that are thus successfully welded will develop checks or cracks on the weld or on the steel if improperly hardened. The writer has found that the well known "Pack Hardening" is the best for welded tools. It will not only give definite and excellent results but it will also add carbon

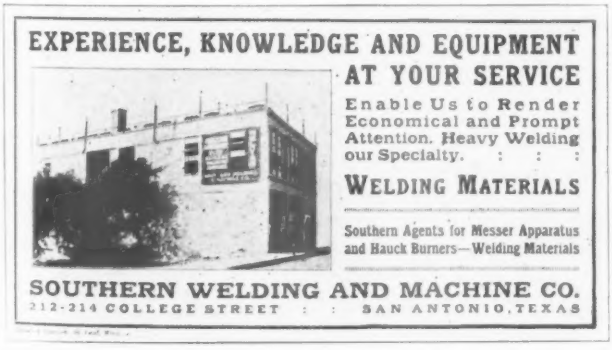
in the welding line from the carbonous material of charred leather and charcoal that is packed in the hardening box. The top stratum of fire clay that prevents any air or the direct fire to strike the tool while it is heated, will prevent the formation of checks or cracks in the welds. After the box with the welded tools gets red hot, and has absorbed the necessary carbon, it should be taken from the furnace, and then removed from the box and immersed in a bath of *raw linseed oil*. The tool should be worked around in the bath until rod has disappeared; it may be then lowered to the bottom of the bath and allowed to remain until cold. When a welded tool ¾ inch or larger is thus hardened, it should be reheated over a fire immediately on taking out of the bath, to a temperature of about 100° centigrade. This will also avoid very small checks, that may be caused by molecular changes which take place after the outside surface is hardened and unable to yield to the internal strains. Reheating the surface to the above temperature will not materially soften the steel.

If stellite has to be welded to low carbon shanks with the oxy-acetylene blowpipe, the same operation may be followed as in the case of welding high speed to low carbon steel, with the exception of the hardening process, which is not necessary. The writer has made various experiments at a local machine shop on welding stellite and although he is not familiar with the composition of this metal, yet he was successful in finding two methods whereby this metal can be welded. The oxy-acetylene process with the nickel steel rod and superior brazing compound was the first method applied. It was necessary during the heating operation to keep a piece of ⅛ inch thick copper plate on the back of the stellite to absorb the excess heat. Specimens of welded stellite without the copper plate showed through micrographic tests, very small checks in the metal. Those that had the copper plate were perfect in appearance and strength.

The second and less expensive method for welding stellite is the electric butt welding which does not need any copper plate, welding rod, or cleaning flux. Those that have butt welding machines will find this process economical and will require less skill for this class of work. There is one point that one must observe with the butt welding, and that is to clean to a brightness previous to welding the side of the low carbon steel that has to be welded.

This process should not be confused with the electric arc welding or the metal electrod process. The method of brazing stellite to low carbon was found unsatisfactory and unreliable. It appears that the alloys of copper and zinc or tin will not work in harmony with the stellite. Furthermore, the peculiar cutting qualities of the stellite, being almost double of that of high speed steel, the cutting point gets very hot, which causes a fracture at the brazing joint.

In the case of welding air hammer or air motor cylinders, the brazing process with the aid of the oxy-acetylene blowpipe offers the best method. It is necessary for this class of work to employ Tobin bronze rods and the superior welding compound. This flux has a tendency to absorb internally in the crack, provided the metal is brought to a bright red; the bronze will then follow the flux and adhere to the edges, forming what we call brass plating; a little more brass added from the welding rod on the surface, will join the cracked edges into a permanent union without the necessity of fusing the metal.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WELDING MATERIALS
Southern Agents for Messer Apparatus and Hauck Burners—Welding Materials
SOUTHERN WELDING AND MACHINE CO.
212-214 COLLEGE STREET : : SAN ANTONIO, TEXAS

How One Shop Advertises. Illustration Is from a Desk Blotter.

WELDING IN THE AIR.

An interesting welding job was recently finished at Peru, Ind., by M. L. Bretton. The heavy pipe broke almost in

two halves, shutting off the water supply without warning. The weld was made in a few hours.

NEW HAUCK BRANCH.

The Hauck Manufacturing Co., main offices and works, Brooklyn, N. Y., have opened a Philadelphia sales and service station, 1711 Sansom street, Mr. H. H. Kress, formerly connected with the selling organization in Brooklyn, as district manager.

The business is conducted in the name of the "Hauck Burner Service Station," where the standard Hauck kerosene torches, portable oil burners, preheating outfits, forges and furnaces are carried in stock.

Mr. M. Moskowitz, formerly engineer for the Prest-O-Lite Co., Indianapolis, is on the Pacific Coast, regaining his health. He expects to return West in a few months.

The Welding Engineer

Published on the 15th of Each Month by

THE WELDING ENGINEER PUBLISHING CO.,

608 S. Dearborn St., Chicago, Ill.

Telephone Wabash 7134.

L. B. Mackenzie.....President and Editor

Subscription payable in advance and postage free.

United States, Canada and Mexico.....$2.00 a year

Foreign Countries ..... 2.50 a year

Single copy, domestic .....20 cents

Single copy, foreign .....25 cents

Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

The Welding Engineer is a member of the Audit Bureau of Circulations.

Eastern Office:

171 Madison Ave., New York. Telephone, Murray Hill 4394.

Max I. Barth, Eastern Representative.

The Welding Engineer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

VOLUME 3. MAY, 1918 NUMBER 5.

The Future of Welders.

WE DO NOT know of a trade which offers as many possibilities as the welding field at the present time. Like many other fields, the welding trade has benefited from the war. That is to say, stern necessity has compelled manufacturers to seek more efficient methods—means of cheapening production. Plants must work on a 100 per cent efficiency basis, new parts (meaning delays and shut downs) must not be ordered so long as there is a quicker and a better method.

As we have often pointed out, the opportunities in the welding field for both young and middle aged men are without number. After the war, when many trades will suffer a depression, the welding business will go marching onward—because welding is an economy measure. We weld because it is a better and a cheaper method.

Should the Army train ten thousand welders (which may be done), there will be places for each and every one of them after our boys have forced a victorious peace on the battle fields of Europe.

It requires from ten weeks to several months to make a welder. Compare this to the length of time required to make a machinist or a boiler maker, or any other skilled mechanic. Compare the pay, the hours, etc., and you will find that the occupation of a welder is a favorable one indeed. The more one knows about mechanics, in fact, the more "horse sense" one possesses, the better welder one makes. But in no other field of endeavor we know of does the same outlay of time produce similar results.

The student welder (and by the term "student" we refer to most welders), who studies and who is not a "know-it-all" has a great future. His is a trade which is fast coming to the top. The war has advertised the trade and the man who lays the proper foundation and who acquires the "goods" is going to reap the reward.

The Experience of France.

AT the beginning of war it was quickly realized in France that "business as usual" would be nothing short of national suicide. Three-quarters of the male laboring population between the ages of eighteen and forty-five were called to arms literally overnight, with the result that French industry during those first awful weeks was largely paralyzed. France was relying upon her accumulated stores of supplies, plus importations from England and America. But after the pressure on the west was somewhat relieved and after it became clear that a long struggle was inevitable, France recalled from the trenches skilled laborers and mechanics who could henceforth serve the nation more efficiently in the industrial army. But when these men were withdrawn from the front it goes without saying that they were not delegated to produce luxuries and non-essentials; they were set to upbuilding war industries to the end that the armies might be certain of obtaining a steady replenishment of the indispensable weapons and materials of warfare. There cannot be the slightest doubt that France would have been crushed during those endless months of waiting for England to organize.

Welding Makes a Million

AN Indiana junk dealer, who understood the possibilities of cutting, has just cleaned up a tidy sum. He bought 232 miles of an old, abandoned pipe line at 60 cents per foot. He cut it up, at a cost of 20 cents per foot, and has sold the whole lot at $1.60 per foot.

WELDING A BELL.

Editor:

I have a cast bronze bell, weighing about 250 pounds, which is cracked. Do you think this could be repaired by oxy-acetylene welding, and if so how would you go about it? What kind of filler rods shall I use? Bell can be removed from belfry. Would we be able to retain tone.

C. Weston & Son.

Answer: "It is perfectly feasible to weld the bell, sketch of which you enclose. We would recommend that you use Tobin Bronze Filler Rod with ordinary bronze flux. You would get a slightly better tone from the bell if you use the same material for the welding rod as the casting itself. This is known as bell metal and varies somewhat in percentages of copper and tin, but probably is two parts of copper to one of tin.

Bevel the crack in the usual manner and heat very slowly and carefully in a charcoal fire, being careful to support the casting while pre-heating and not to get it too hot, a temperature sufficient to melt lead when placed on the casting being hot enough. Any good welder who has had experience in welding brasses and bronzes and who understands the first principle of expansion and contraction should be able to do this job." Editor.

OXYGEN UNDER PRESSURE.

Editor:

Is it safe or practical to pipe oxygen from 200 ft. tanks, say 20 ft., using ¼ inch double strength pipe and fittings?

M. Keenan.

Answer: "We would not advise that you pipe oxygen under 1,800 lbs. pressure through a double strength pipe and fitting. In our opinion this would be hazardous. Properly you should put this problem up to an apparatus company and copper tubing of the right strength brazed or silver soldered into bronze fittings designed for the high pressure to be used. Editor.

GENERAL WELDING & EQUIPMENT CO.
G.W.&E.C.
107 MASS. AVE. BOSTON, MASS.

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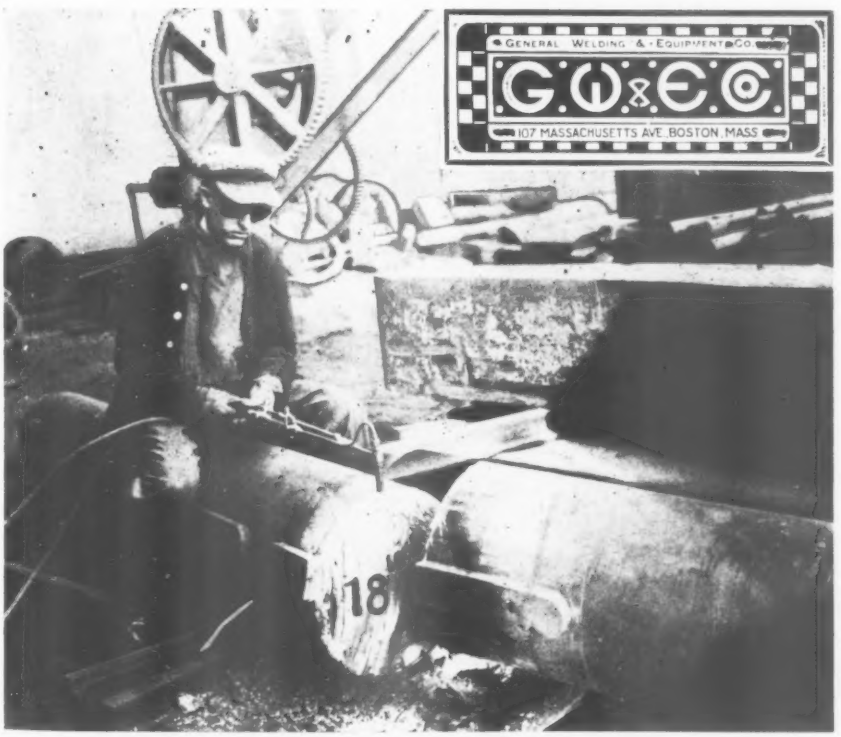

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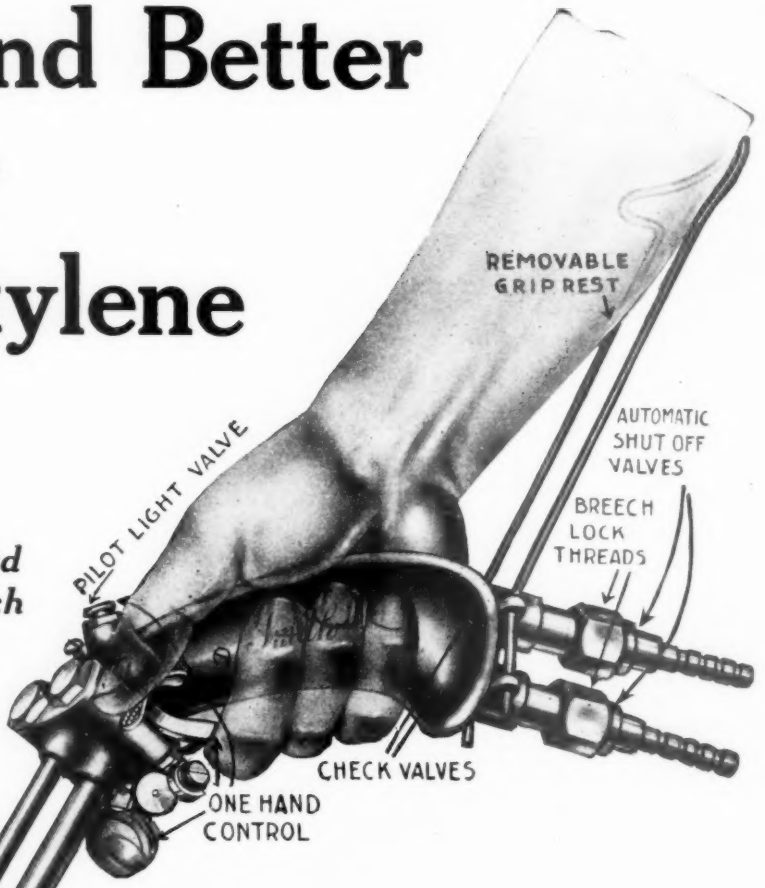
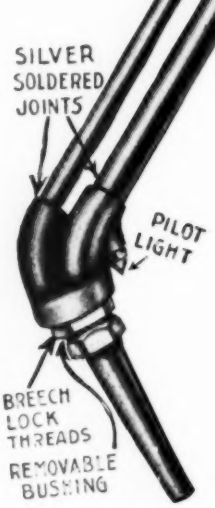
A New and Better Torch for Oxy-Acetylene Welding



All Controls Operated by Hand Holding Torch

SMITH'S PISTOL GRIP WELDING-TORCH

ELMER H. SMITH'S NEWEST INVENTION



Twelve Advantages Found In No Other Welding Torch

1. One Hand Control
2. Pistol-grip—Easy Position
3. Pilot Light—Press Button to Light Up
4. Breech Lock Threads—Change Tips Quickly
5. No Explosion Possible—Danger Eliminated
6. Arm Rest—Robs Long Jobs of Fatigue
7. Renewable Bushing—Quick Easy Repairs
8. Automatic Shut Off Valves in Hose Lines
9. All Valves Interchangeable, Simple, Sure
10. Check Valves—Both Hose Lines Protected
11. Mixing Chamber Contained in Each Tip—
12. Low Pressure Torch—½ to 1½ lbs. Acet. Pressure

Costs Less Than Other High-Grade Torches

SMITH'S
PISTOL GRIP
WELDING TORCH

These Twelve Real Advantages Save Time, Expense, Labor and Make Good Welding Easy to Do

Among the most successful acetylene welding torches in use today are those which were invented by Elmer H. Smith, who has now designed what he believes is the perfect torch, because it greatly increases the abilities of skilled welders, and enables less skillful operators to do good work. Remember, no other torch has any of these improvements.

One Hand Control

Both controls are operated by the hand holding the torch, the acetylene by the first finger, and the oxygen-supply by the thumb. Slight movements of finger and thumb increase or decrease the flame instantly. No needle valve to screw open or shut. The proportion and volume of gases may be varied instantly.

Pilot Light

Press the button to light the torch. You can light it and adjust the flame with one hand in two seconds. If two hands are required to turn the work, put the torch out instead of allowing it to burn gas.

Pistol-Grip

The straight grip torch in manufacturing or bench work places the wrist in a most tiresome position. For overhead work, cutting, etc., we make a much straighter grip. The Pistol-Grip leaves the hand and wrist in a normal position and makes the torch much easier to handle. It also makes one hand control entirely practical. This balanced torch is surprisingly light to handle.

Arm Rest

This adjustable arm rest relieves the operator of any necessity of gripping the handle. It actually hangs on the fingers, leaving the thumb and index finger free to operate the controls.

Breech Lock Threads

Both the tips and the hose connections are made with Breech Lock Threads, requiring only a quarter turn to lock them securely, gas tight. This system is used in the Breech of the field guns. You can change tips with this torch in one-third of the time required to remove the tip from any other torch. It is an advantage every operator will appreciate. It saves time and saves gas.

Renewable Bushing

The bushing into which the tip locks is threaded into the torch head. When the inexpensive bushing wears it may be replaced quickly and the torch is good as new.

Automatic Shut-Off Valves

When the hose lines are detached from the pistol-grip the automatic shut-off valves close the line, making it unnecessary to shut the gas off at the generator or tanks.

Valves Interchangeable

The shut-off and control valves are interchangeable, extremely sensitive, yet very simple, durable and inexpensive. It is only an instant's work to change them.

Check Valves.

The automatic check valves in the pistol-grip safeguard the operator against oxygen backing up into the acetylene cylinder or vice versa.

Mixing Chamber In Each Tip

A mixing chamber in each tip insures proper mixture of correct proportions for the size tip employed, enabling even the novice to keep the flame right.

Greatest Gas Economy

This torch will work with acetylene pressure as low as ½ lb. Cylinders which have been thrown aside as empty often enable the operator to work for half an hour with the Smith Pistol-Grip Torch.

Highest Grade Workmanship

Many of these advantages depend upon the workmanship put into the torch. We have carefully worked out every detail to secure the utmost convenience in manufacture, and to standardize the parts. They are made on automatic machinery and punch presses which result in each being perfect and interchangeable.

Lowest Priced High-Grade Welding Torch

We can build and market this remarkable torch, with twelve exclusive advantages, at a price actually lower than asked for any other high-grade torch. Compare our price with any of them—**$33.75.**

Sold on Iron-Clad Guarantee

Smith's Pistol-Grip Welding Torch is sold on an iron-clad guarantee of satisfaction or money refunded. If you buy this torch and at the end of ten days are not entirely pleased you are authorized to return the torch either to us or to any jobber or dealer from whom you bought it and your money will promptly be returned to you. This we specifically authorize any jobber or dealer to do. Write for catalog.

Jobbers and Dealers Wanted

We have a high-grade proposition for jobbers and dealers. Write for it.

SMITH'S INVENTIONS, INCORPORATED
DEPT. A
MINNEAPOLIS MINNESOTA

OPPORTUNITY FOR YOUNG MEN.

The government is in need of men who have learned the welders' trade, and is appealing for such help and urges young men to learn how to weld. This should encourage men to grasp the opportunity of making themseles proficient in the work, not merely because it will give the man excellent opportunity of performing a highly patriotic duty. Welders are greatly needed in the shipyards where hundreds of ships are being built. This want the government is endeavoring to supply by establishing schools in various parts of the country.

The Wisconsin Welding & Cutting Co. has opened a school at its plant in Milwaukee. The school was opened about a month ago, and there has been a steady growth in the number of those availing themselves of the opportunity it affords.

The following is characteristic of letters sent out to inquirers concerning the school:

"Your letter of recent date asking for further information regarding our course in welding is at hand. We can tell from the fact that you are interested in learning this profitable trade that you are an ambitious young man who will appreciate the opportunity to take instructions under experts in one of the greatest institutions of its kind in the northwest.

"Before we tell you about our course let us assure you that you have chosen one of the best paying trades in the United States—a trade that is crying for men. Uncle Sam is one of the greatest employers of oxy-acetylene welders the world has ever seen. In the oil fields of the southwest, where fortunes are made every day, welders are at a premium and are earning from $5 to $8 a day.

"And the best part of it all is that with the proper instructors and in the right kind of school you can learn this wonderfully profitable trade in a very short time. Very few of our pupils find it necessary to study longer than three or four weeks in our school. You see we give them a practical course on work that is actually coming into our plant. As the grade of work we turn out is of the very highest quality, pupils of our school find it very easy to find work after they graduate.

"The price of the course is really only a trifle when compared to the enormous advantages enjoyed—$50 covers the entire cost and while we cannot, of course, guarantee to make an expert of you, we will say this—if you are at all fitted to be a mechanic of any kind we can promise you that the trade of a welder will be a snap for you to learn. There are men who have no practical ability at all and to these men we will frankly say 'You cannot enter our school.'

"But to the man who looks to us as though he would make a good welder we will say—'Come in and let us teach you the most profitable mechanical trade known to industry.'

"Suppose you drop in today and have a talk with the principal of our school and inspect for yourself the facilities we offer our students for becoming practical welders capable of earning from $5 to $8 a day. Yours truly,

"Wisconsin Welding & Cutting Co."

Sheboygan is especially interested in the Wisconsin Welding & Cutting Co. It has a plant in this city where the oxygen used in the process is manufactured. These are the officers of the company: President, E. M. Parmelee; vice-president and treasurer, H. J. Mueller; secretary, L. P. McBain.

The company was organized four years ago. The Milwaukee *Journal* says of it:

"The company is equipped to weld anything from a small pipe to a huge boiler and is also so well equipped that it can do the work promptly. Experts are available day or night to give adequate and efficient service. The company calls for and delivers such work as can be handled in the shop. Some of the biggest jobs in the city and county have been done by this company, which in the four years of its existence, had acquired a large and particular clientele. It is one of the thriving concerns of the city."

OPPORTUNITY FOR WELDERS

Welders, auto repairmen, machinists, boiler makers, etc., are wanted for the Seaforth Highlanders (Mackenzie Clan). Men under 55 are accepted. If interested write the Editor of The Welding Engineer.

CUTTING WITH METALLIC ELECTRODE

By C. L. Jones.

It will probably be news to many welders that the metallic pencil is better for certain cutting operations than the carbon, and from my own experience I have found that for this work the metallic pencil possesses many important advantages over the carbon.

In order to do cutting with the metallic pencil we must have an excess of heat; enough to burn up the metal, and this we get by cutting down the current and increasing the arc voltage. It is the high voltage that enables us to do a job of this kind.

The method of procedure will be best understood from a consideration of some particular job. We will take for instance a small casting which has broken in some place where dismantling requires considerable time, and where it also would be necessary ordinarily for parts to be preheated to a certain extent before welding. The writer has discovered that the dismantling can be eliminated, the job prepared for welding, and the necessary heating done at one single operation with the metallic electrode.

In the first place, a casting that is broken usually comes into position and into true alignment when the broken parts are placed together at the fracture. This takes care of the setting up of the job which is one of the most important operations in securing a satisfactory repair. Next comes the preparing of the parts for welding, which is done in the following manner:

First drive a thin wedge into crack, opening it about ⅛ inch if possible, to allow for shrinkage. Then if the part to be welded is in such a position that it can be welded from both sides, take the metallic pencil as though you were starting to weld, using a high voltage and low amperage adjustment. Your machine should be of the type that will give high voltage adjustment irrespective of amperage, as the force of the high voltage causes the metal to melt and flow out more rapidly.

With the weld vertical, start your arc in the usual manner at the lower end of the crack, on opposite side from where your wedge is driven, allowing it to remain in one spot, slightly drawing away until a bubble of molten metal is formed; then hold the arc very close to the bottom of the molten metal, causing the bubble to break and fall free (as in cutting with carbon pencil), then work the arc very close to the metal again forming another bubble, taking care to work back to edge of bubble while it is in molten form, and so on until you have taken out enough metal to give you a good welding surface to the center of the piece to be welded, beveling to about 45 degrees.

Then, while the parts are still hot, you run one thin string at the bottom of your V (which is the center of broken part) full length of crack in order to hold the parts in alignment while you are cleaning the opening with a stiff wire brush; or if necessary use a chisel to knock off any bad spots that would be likely to interfere with the welding. This should be done as quickly as possible in order to hold the heat which was produced by burning out.

After the first thin string is run and the opening cleaned, run one more on top of the first one for safety in holding parts in place while other side is being burned out. Remove the wedge and burn out the other side as quickly as possible, in order to get your weld started on that side before too much expansion takes place.

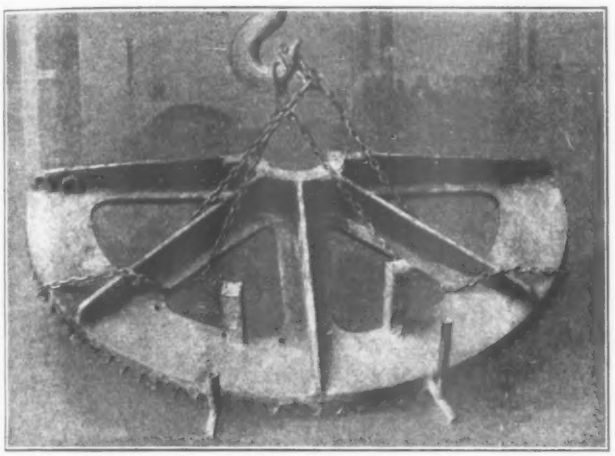
When the second side is prepared, as the first one, start your welding work, welding first on one side and then on the other, completing the entire weld without stopping and while the parts are still hot from burning out. This insures good results by equalizing the fusion of the two metals, a thing more difficult in cast iron than with wrought iron or steel.

Welding From One Side.

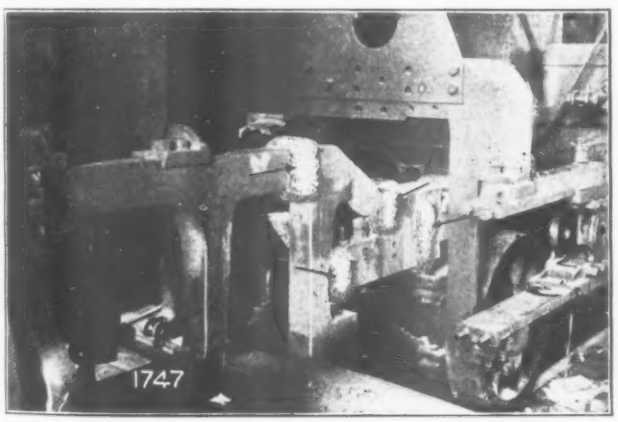
Where it is impossible to weld the broken part from both

*Instructor, Arc Welding Machine Co., New York.

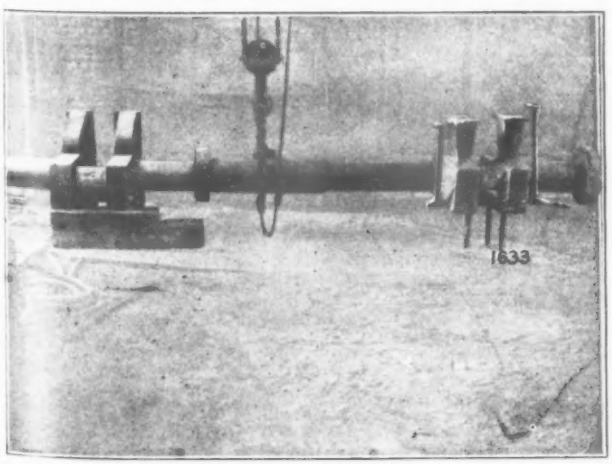
New neck cast on to large roll made with the aid of Thermit and having the pods cast in at the same time.



Large bevel gear on which two new teeth and crack have been repaired.



Four Thermit welds on locomotive frame on the Missouri Pacific Railroad, made without removing the frame from place.



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sides, we proceed as follows: If possible, the crack should be opened by means of screw jack, as it is practically impossible to get a weld in the center of the part for the purpose of holding the piece in line, if a wedge is used. However if a wedge is used then you must spot the crack on one side and burn out on the other; consequently, when the wedge is removed the strain is thrown on the side that is spotted causing it to buckle out of alignment. Therefore we always endeavor to use a jack, where welding is to be done from one side only.

When the jack is placed and crack is opened to about $\frac{3}{4}$ or $\frac{1}{8}$ inch (depending upon the size and nature of the job) we will then start burning out, taking care that parts do not get out of line. Just as soon as the metal is burned out and the opening is cleaned, the weld should be started; and as soon as the weld is completed, the jack should be removed to allow the contraction to take up the allowance made by the jack for shrinkage.

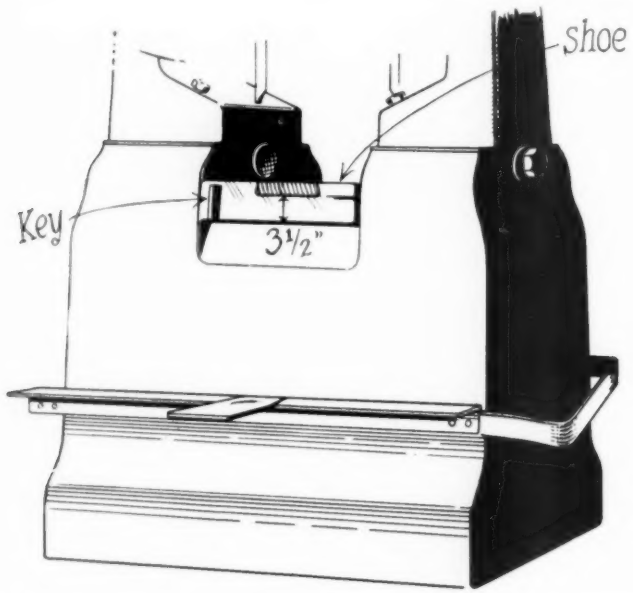
You can readily see that by this single operation of the metallic pencil five laborious operations are eliminated, namely: chipping or grinding, beveling, lining up, preheating and assembling; thus affecting a tremendous saving in time and production.

REMOVING OF DROP HAMMER SHOE BY CUTTING TORCH.

Editor:

We have almost reached our tenth anniversary, and during the past ten years, we have been called upon to weld a large number of intricate jobs, and have in practically every case been successful.

However, each day brings forth some new problem and we are constantly being called upon to perform some operation,



which, if carried out along mechanical lines, would take several days, and in some cases weeks, to perform, but with the aid of our welding and cutting torch, we find it possible to perform the same operation in a few minutes.

As an example of such a case, where a number of days of work can be accomplished in a few minutes with the use of a high grade cutting torch operated by an experienced cutter, we would call your attention to the print of drop hammer base. You will notice a steel shoe resting on the base of the hammer, which is held in place by a key wedged in between the shoe and the base. Due to constant hammering, this key will be upset, and it is impossible to remove the key except by drilling it out with an electric or air drill, which is a matter of several days' time, and if the man operating the drill is not extremely careful, he will drill into the base of the hammer, and it is very necessary that this base be kept perfectly smooth and flat.

You can readily see, therefore, what a great saving in time, as well as money can be made on this particular job, as we were able to remove the shoe in just eight (8) minutes from the time our torch was lighted. The size of the shoe was 20 inches long by 14 inches wide by 3½ inches thick. Our method of carrying out this work was as follows:

We started cutting on end in center of shoe and the operator moved his torch from side to side for a distance of about ½ inch. This made the curve sufficiently wide so that the slag would not back up and stop the cut, in this way he continued through an inch or so beyond the center, then he started cutting on the opposite end of the shoe, continuing toward the center until he reached the first cut. It was necessary to cut from both ends, as the operator was unable to see just what he was doing after cutting in about 14 inches. Upon removing the shoe, we examined the base, and the superintendent of the plant at which this work was done was very much pleased to find that the base was not affected in the slightest degree.

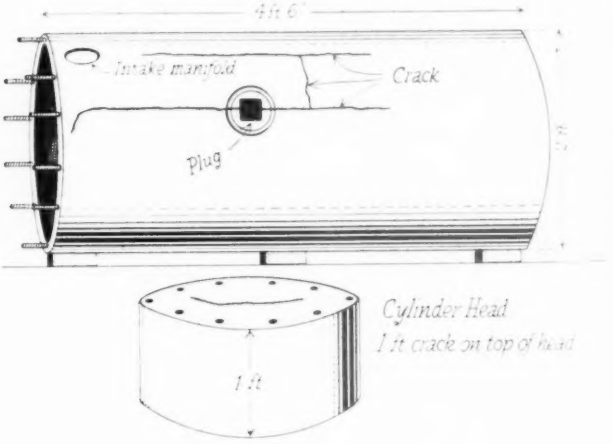
It is quite possible that a number of readers have carried out jobs identical with this one, but we wish to reach those who have not, and believe there are a large number in this class, and we would advise repair men to get in communication with the drop forge concerns in their vicinity and let them know that you can perform such an operation as above outlined and we are sure you will find they will greatly appreciate the information, and you will be repaid accordingly.

J. F. Tucker, General Manager,
Springfield, Mass. Cave Welding & Mfg. Co.

STEAMSHIP WORK.

Editor:

We are enclosing herewith sketch of welding job which we recently completed for the Clyde Steamship Co., of this city.



We had no trouble whatsoever with this and made a good profit on the job.

We have also just completed a welding job which consists of a broken cylinder and cylinder head of a 50 H. P. Fairbanks-Morse gas engine, for which we received $250. Photographs of this will be sent you as soon as they are developed.

Both of the above jobs were done by James Hahn.

First, we dissembled job, then set up on three brick supports to prevent sagging, used portable emery grinder to prepare job. For preheating we used two barrels charcoal, two gasoline torches, ten gallons gasoline, taking six hours to preheat, using No. 3 Oxweld extension torch, twelve pounds cast iron welding rods, actual time in operation of torch three hours. Actual time in stripping, preparing, welding and assembling, sixty hours. As the crack extended across the

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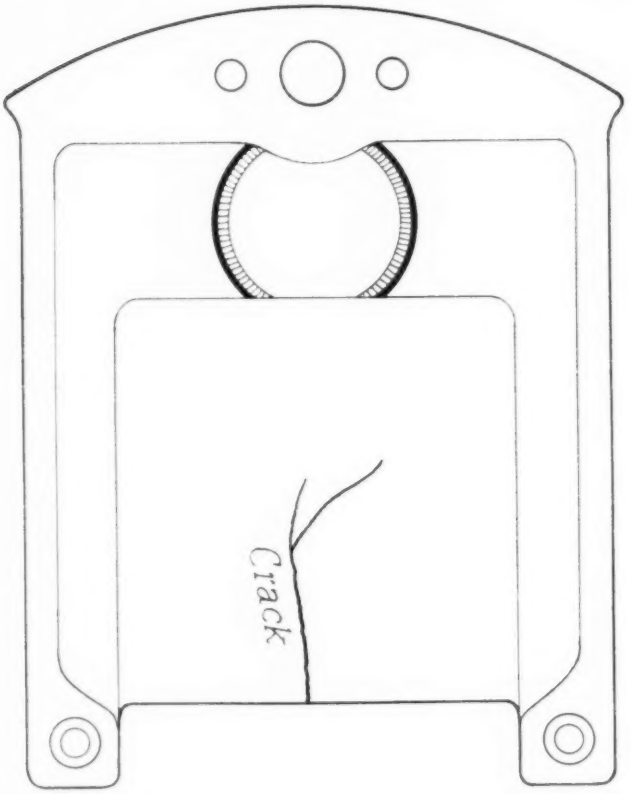
water outlet hole, we welded plug in same, after assembling job we drilled and tapped a new hole where old plug was.

The above is a 50 H. P. Fairbanks & Mors. Cotton Gin Engine. It is now installed and giving perfect satisfaction.



We might add that the crack was caused by the freezing weather this winter when the thermometer dropped to ten degrees above.

We received $250.00 for the job and everyone is satisfied.

This sketch was referred to in our last letter, photographs of which did not turn out.

Charleston Welding Works.

WELDING A GEAR WHEEL

Editor:—Fig. 1 shows face of cut gear wheel, about 24 in. diameter. Had been repaired by screwing studs in face. They gave way, breaking part of rim, about as shown in Fig. 1. A

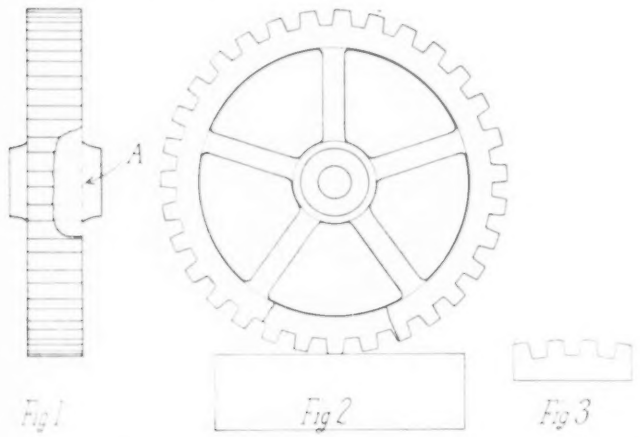


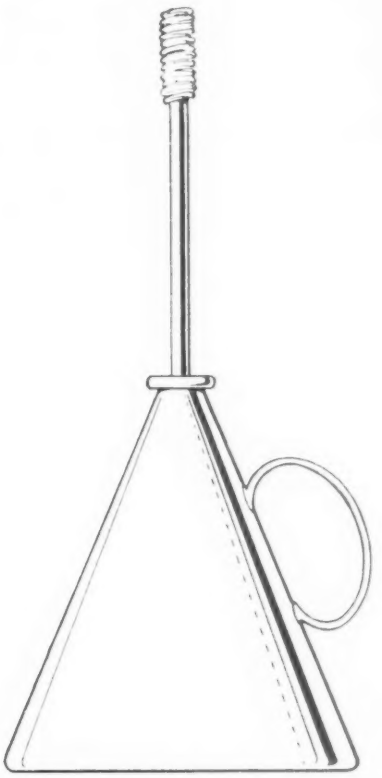
Fig 1 Fig 2 Fig 3

form was made from a carbon block to exactly fit over face of wheel. Wheel was set on a block, as shown in Fig. 2. Wheel on block were then preheated by torch and section of rim built in. The job was perfect, without machine work and is in service.

O. O. Lemon,
Roanoke Welding Co.

CAR REPAIRER'S TORCH

The illustration shows how one railroad company employs the services of welders. This torch is welded throughout. A piece of asbestos rope is wound around the end of tubing. Before lighting it is necessary to tilt the torch, which causes



oil to run down tubing and saturate asbestos rope. The torch will then burn for a period, until tilted again. Should the workman go away and leave it the torch will go out.

FIRE BOX WELDING

Editor:—Am sending you a sketch of a welding job which I had in a fire box. The calking edge of lap where fire door sheet is riveted to side sheets had been driven back by calking tool to rivet line until it was useless to try calking any more. In places there were a number of checks in lap that run back as far as rivets and was leaking very bad. To start this job of saving the fire box I commenced at lower end of the part to be welded and welded side sheet to door sheet up as far as first check, in order to hold both sheets together so as to remove the rivet without allowing any slack to take place between sheets. Then with the welding torch I V'd out part of lap that had cracked to rivet and then melted head off rivet and backed same out with hammer and punch, then I proceeded to weld the sheet again I welded at bottom of V to sheet behind welding the two together and then building up the counter sunken part of sheet, flush with top of sheet. Then by driving a drift pin into hole, while yet very hot, made hole perfectly round and ready to be topped for a patch bolt. Then dropping across to calking edge of seam I again proceeded with welding sheets together up to next check and so on, until I had about 9 rivets on side of fire box and 20 along crown sheet across to as far as above fire door. In welding the two sheets in this manner the welded part holds the sheets secure and allows one to remove rivets without sheets spreading apart. All that is left to do is to tap out these holes and put in the patch bolts, making that part of fire box double strength. In using the welding torch to remove the head of rivets I did not lose my heat, which would have been the case if I would stop and put on cutting to

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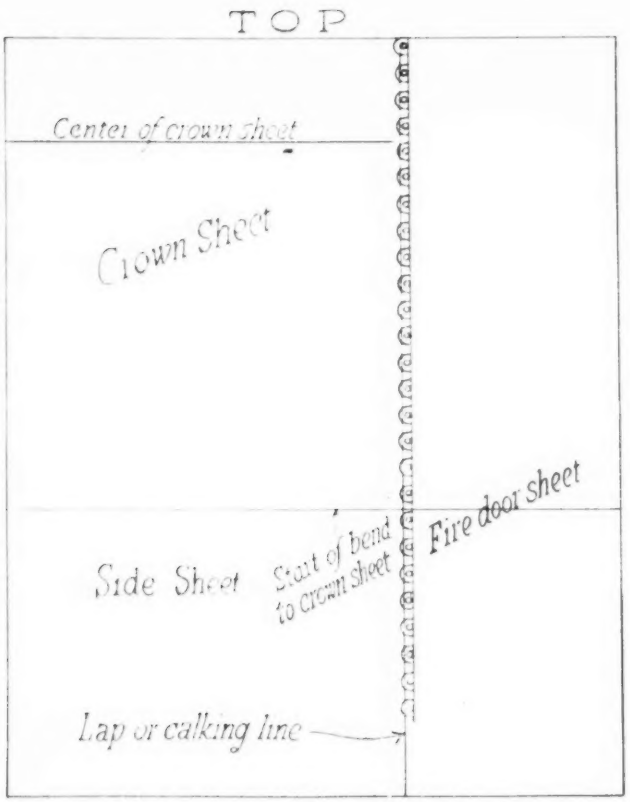


remove it and then back to welding torch again. In thirty-six hours this engine was ready to go back on its regular trip and has shown no signs of a leak.

H. L. Blackwood.

BRAZING

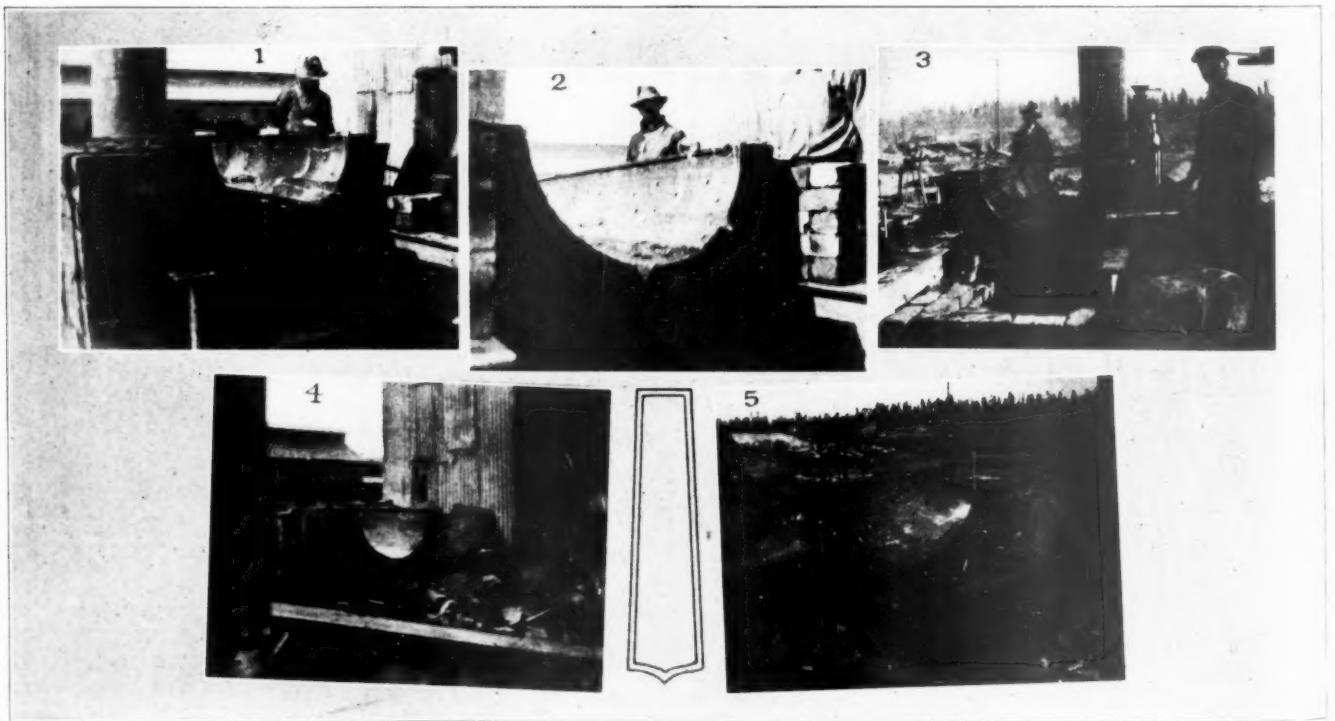
Editor:—When brazing with the oxy-acetylene torch we found it very advisable to use a wet flux instead of having it dry. The majority of the welders are heating their brazing wire and dip it in the flux container. This may be all right in some cases, but wherever a strong joint is required boracic acid, mixed with a little water to a paste cannot be bea[t]. Let me tell you of a test recently conducted in our new pl[a]nt, of which I am in charge. We made up 14 pieces, all alike. Seven were brazed the common way by dipping the hot spelter wire in dry boracic acid. These seven pieces gave way after we put 1,100 lbs. on them. The other seven pieces were brazed with a wet flux (boracic acid mixed with water to a paste). We first brushed a little of this flux over the spot that was to be brazed, then heated our metal up to a bright red and started to braze. During the process of brazing we dipped our spelter wire into the dry flux to keep it from oxidizing and burning. The result was that these seven pieces gave way after having stood up under 8,000 lbs. pulling stress or 6,900 lbs. more than the first lot, brazed with dry flux. Quite a difference, is it not?

Ernest Oleman,
Black Rock Welding & Brazing Co.

LARGE BEARING CASTING

Editor:

You will find enclosed pictures of a very rare job for field work by the Oxy-acetylene process. As I have never seen a job as large as this done in the field I think it may interest some of the welders around the country. The pictures show a bearing casting of a large type rock crusher of the water cooled type. This bearing being 6 inches long 42 inches wide across the top and from top to bottom 22 inches, it weighing 10,600 lbs. or a little over five ton, as shown in pictures 1, 2 and 3. The breaks run lengthwise and cross shown by X on No. 3 is a crack around circle. There being three cracks lengthwise shown by V shaped on No. 1, 2 and 3 before welding. In doing this job it was necessary for me to build a furnace around the casting, which is shown, in order to heat before beginning. Nos. 1, 2 and 3 show all cracks from both ends before welding and Nos. 4 and 5 show job after welding is completed. This job was done by Mr. W. A. McPearson, ofthe Guarantee Welding Shop, 935 N. Main St., Los Angeles, Cal., for the Riverside Portland Cement Co., at Riverside, Cal., and was done with a Burdett torch and a No. 14 welding tip, which is used exclusively by the Guarantee Welding Shop. The cost of this job was as follows: Welders' time from start to finish 53 hours, 1,500



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Hold on! What were you doing just then? Storing away that interesting bit of welding experience, or a photograph, perhaps? Don't do it? Give it to us. We want to show it to 4,099 other readers of The Welding Engineer (you're the forty-one hundredth). If there are objectionable features to it, just leave it to the Editor (he studied surgery), cutting off and adding to is his hobby.

Another thing, when you work out a successful solution to a welding problem write us about it. Grammar and composition don't count—it's ideas we want. If a sketch would illustrate your job in good shape, just make a rough pencil sketch; our draughtsman will do the rest.

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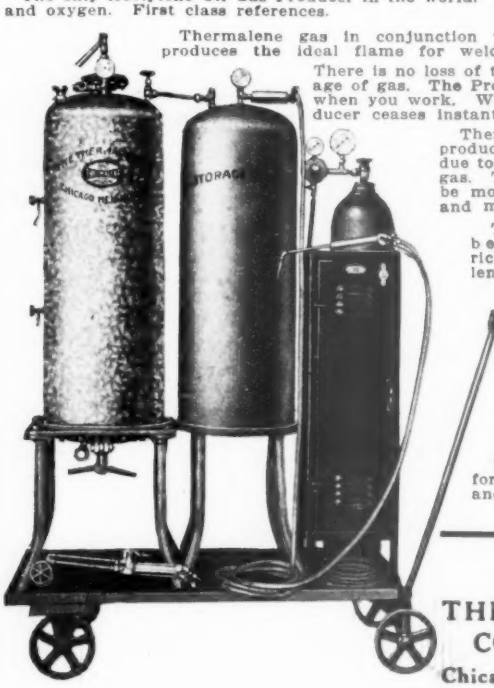

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cubic feet Oxygen, 1,400 cubic feet acetylene gas, made from carbide with Vulcan Generator and 96 lb. welding rod. This job was done by one man and a helper, which is very seldom undertaken on such a large job, but it was impossible to get another welder so it was started and finished by Mr. McPearson on a continual stretch of 53 hours. The method of heating being with wood under and above and when bearing was hot the lower part was covered up and top covered with asbestos sheeting and work continued until cooling took place. Then another fire was built on top as fire was kept burning at all times under bottom side. After this bearing was finished it was babbitted with nickel babbitt, and it took 1,600 lbs. of metal to babbitt the bearing, so you may judge the size of the shaft, which was 23 inches in diameter and weighed 10 ton. The bottom of this crusher which hangs on this bearing weighed 40 ton. This being, I think, the largest job that has been undertaken by any firm of welders, so I would like to hear from any one if they have anything as large, or broken in so many places. We make a specialty of heavy welding.

Guarantee Welding Shop,
W. A. McPherson.

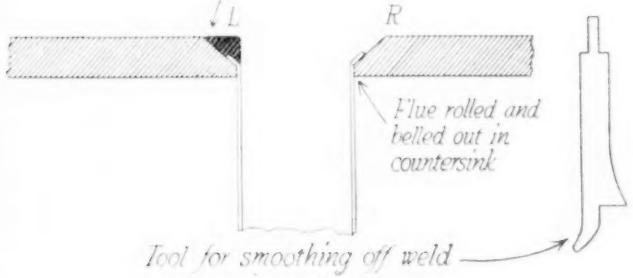
WELDING LOCOMOTIVE FLUES.

Editor:—

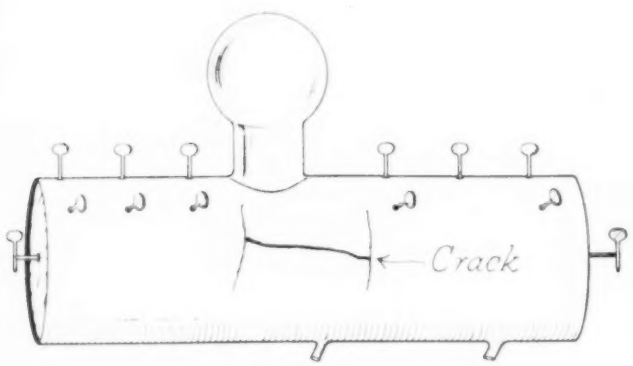
I once wrote you mentioning the welding of flues in a locomotive.

My sketch accompanying may prove too much for you, but I am not a draftsman.

We first countersink the flue holes, then inserted flues and



rolled them tight, without coppers, allowing end of the flue to project about half the depth of the countersink past the bottom of the countersink. Then bell the ends back on counter sink as shown on R side of sketch. Then I use a



No. 10 tip and proceed to weld the flue to the countersink, fitting edge up to square, as you notice on L side of flue sketch, being careful not to burn the flue back past the bottom of countersink at any time. I then take a No. 1 Thor air hammer and, using a squared tool as per sketch, run around the weld very lightly. This makes an extra smooth looking job, leaving no projections to be burnt off, such as the Beading Method affords and it also closes any stray pinholes which you know are hard to keep away from in an old sheet full of alkali.

I always leave the front end of the flue loose in the sheet until after welding is completed.

The 32 super heater flues weld averaging one in 30 minutes.

I would like to ask you my trouble in welding brass castings. Is it proper to follow the same method of preheating as with cast iron?

One job in particular gave me trouble. A lubricator cracked on front side. I preheated and as we were out of manganeze bronze, I used some brass spring wire, and preheated. When I took my torch off it began cracking from each corner of main crack, making a letter H. I decided the cause was the spring brass wire I used as filler, so waited until we got the bronze. I have not as yet finished the job thinking it possible that I may be wrong in preheating brass castings. Which is the correct method? C. R. Woleslagle.

Answer: It is desirable to preheat heavy brass sections both for economy and to avoid contraction cracks. Use a large tip and remember that area round weld must be at a red heat before cone is brought down sufficiently close to melt the break. Editor.

Mr. C. A. McCune, former Chief Engineer for the Commercial Acetylene Supply Co., is now with the Page Steel & Wire Co., and not the American Rolling Mill Co., as stated in our April issue.

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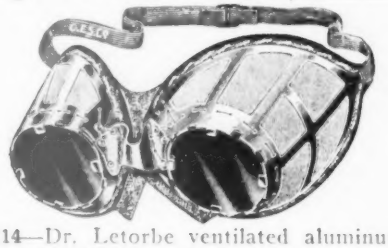

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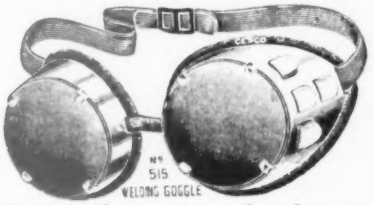

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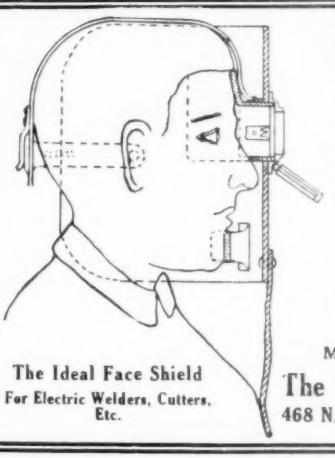

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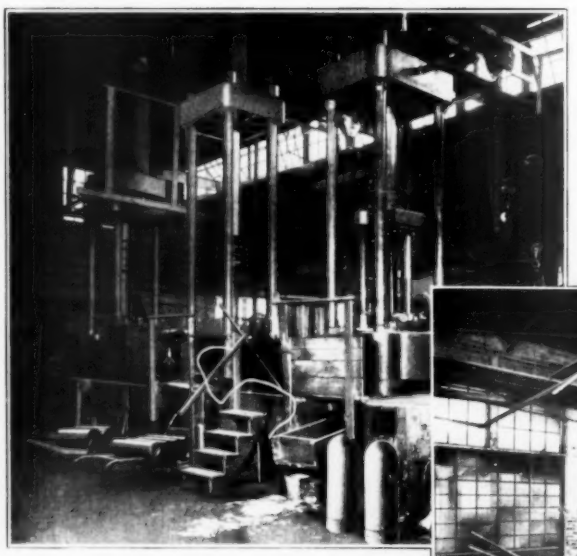

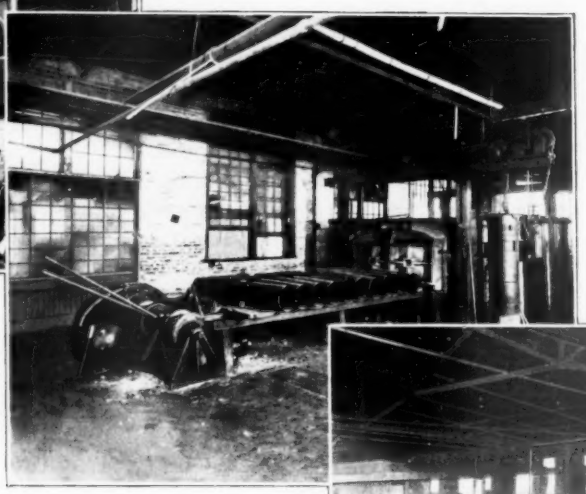

To those engaged in the manufacture of Drawn Steel Products, but are intended, however, to acquaint those not familiar with that branch of the Steel Industry with the Apparatus employed in the construction of Commercial Cylinders.

If these views are not interesting to everyone that of our next installment surely ought to be as it will deal with the most vital part of an Acetylene Cylinder—the Porous Filler.

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